Volume 103
Article 08

FISHERY RESEARCH

Job Performance Report
Grant Number F-73-R-18

Project 8. Hatchery Trout Evaluations

By:

Jeff C. Dillon
Senior Fishery Research Biologist

Charles B. Alexander
Senior Fishery Technician

December 1996
IDFG 96-28

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JOB PERFORMANCE REPORT

State of: **Idaho** **Grant No.:** **F-73-R-18. Fishery Research**

Project No.: **8** **Title:** **Hatchery Trout Evaluations**

Contract Period: **April 1. 1995 to June 30. 1996**

ABSTRACT

We continued put-and-grow stocking evaluations in 1995 to compare returns and cost to the creel for fingerling and catchable size rainbow trout *Oncorhynchus mykiss.* Since 1992 the study has included 18 lakes and reservoirs statewide. All were stocked with both fingerling and catchable-size trout. We used creel censuses to estimate returns and cost to the creel, and assessed limnological characteristics, zooplankton populations, and fish community in each water.

Fluctuations in water years and reservoir levels from 1992 to 1995 have limited our ability to describe the mechanisms influencing stocking success. Fall fingerling returns were correlated with water levels and July zooplankton size structure the year of planting. Where zooplankton X2.0 mm were absent in July, fall fingerlings did not meet return goals. Fishery managers can use this information to help predict success of fall fingerling plants.

Data for spring fingerling and catchable-size plants were insufficient to statistically describe factors influencing returns. We plan to continue evaluations through 1997. New stocking evaluations should focus on waters with some combination of spring fingerling and catchable stocking.

As part of continued work on trophy trout reservoirs, we attempted to estimate survival of fish planted in Daniels Reservoir from 1992 to 1994. We conducted a population estimate using purse seining and electrofishing gear. Estimated survival of 1994 fall fingerlings to June, 1995 was 9% to 16%. Recaptures from other stocked groups were too low for individual estimates. Total population and standing stock estimates derived from the combined-gear data were about double previous estimates with electrofishing data only. Limited mixing of fish from near-shore to offshore areas suggests that single-gear sampling may be insufficient to fully describe or enumerate trout populations in lakes and reservoirs. Single-gear sampling is probably adequate for routine population monitoring or collection of trend data.

We also conducted a pilot study to test whether catchability and returns of put-and-take rainbow trout in streams could be enhanced by food-training with bait items. We trained fish for five days at a hatchery prior to release, and stocked them with control fish (four paired stocking events). Total returns were significantly higher for trained fish, although results varied

among plants. Additional experiments will be required to fully describe the benefits and evaluate cost-effectiveness of food training to improve returns.

Authors:

Jeff C. Dillon
Senior Fishery Research Biologist

Charles B. Alexander Senior
Fishery Technician

INTRODUCTION

Rainbow trout *Oncorhynchus mykiss* are the most popular game fish in Idaho (Reid 1989). In 1987, an estimated 26% of all angling effort in Idaho was directed at trout in lowland lakes and reservoirs. Most of these fisheries are supported by put-grow-and-take hatchery plants of fingerling and catchable-size fish. About 75% of the catchables and 90% of the fingerling rainbow trout produced by Idaho Department of Fish and Game (IDFG) hatcheries are stocked in lowland lakes and reservoirs. Hatchery trout provide much of the consumptive harvest opportunity in these waters. Hatchery trout programs are expensive, however. The annual resident hatchery budget ($2.65 million) represents about 35% of the annual resident fisheries budget.

The dependence of many lake and reservoir fisheries on hatchery trout, and the cost of the hatchery program, make it important to maximize stocking efficiency. This means determining the best number and size of fish and time of year to stock to optimize catch rates and creel returns in each water. In the past, few stocking evaluations in Idaho compared the relative returns of fingerling and catchable-size fish in lakes and reservoirs (Dillon and Megargle 1994). Stocking strategies are based on the experience and trial-and-error of individual fisheries managers. As with most other state agencies, IDFG has no standardized approach to determine appropriate stocking strategies. There are return targets for put-grow-and-take fisheries (100% by weight) and put-and-take fisheries (40% by number) (IDFG 1990), but it is unclear how often we meet these objectives.

In 1992 IDFG began new statewide stocking evaluations to better define the tradeoffs between various put-and-grow trout stocking strategies in Idaho lakes and reservoirs. We also included data from evaluations begun in 1990 and 1991 on two waters. These evaluation data, along with additional data to be collected through 1997, will be used to develop statewide trout stocking guidelines based on lake and reservoir characteristics and angling effort. This report documents progress toward that goal through 1995 and includes two additional stocking evaluations completed since the previous report (Dillon and Alexander 1995).

IDFG manages most hatchery-supported waters as consumptive trout fisheries but also manages ten lakes and reservoirs for trophy trout. These are stocked with various combinations of fingerling and catchable-size fish. Regulations restrict harvest, with a two-fish >20 in (508 mm) bag limit and artificial lures and flies with single barbless hooks only. The objectives of the regulation are to reduce angling mortality and to provide increased catch rates with at least 20% of the fish caught >16 in (406 mm) (IDFG 1990). Evaluations of stocking strategies, angler use, and fish population size structure have been limited to a few waters, including two in the current study.

In two trophy trout waters evaluated in 1992-1994, Daniels and 24-Mile reservoirs, fish population size structure exceeded the management objective (Dillon and Jarcik 1994; Dillon and Alexander 1995), but legal fish were extremely rare in electrofishing samples. Stocking rates in these two waters have been reduced since 1992 to half those of nearby yield fisheries. We continued our evaluation of fish populations in Daniels and 24-Mile reservoirs in 1995 to monitor the effect of reduced stocking rates on survival, growth, and population size structure. Describing relationships among these variables should help us manage these and other trophy fisheries more effectively.

In 1995, we began preliminary work to test methods to improve return to creel of put-and-take trout in streams. Stream returns can be influenced by several factors, including angling effort, stocking rate, stream size, and survival and catchability of planted fish (Mauser 1992, 1994). In-hatchery training or conditioning of fish to modify survival or catchability has met with varying degrees of success (Fortmann et al. 1961; Casey 1969; Webb 1969; Bricker 1970). Most of these studies focused on improving survival by conditioning fish to natural food, predators, or physical conditions (Suboski and Templeton 1989; Wiley et al. 1993).

We speculated that the catchability of hatchery put-and-take trout could be enhanced if they recognized typical bait items as potential food. We conducted a small pilot study to determine whether training hatchery trout to eat bait items could improve catchability and returns in stream fisheries. The preliminary results in this report will be used to refine methods for more extensive work in the future. If trained fish do provide better return to creel, fishery managers could stock fewer fish and still maintain acceptable catch rates and harvest levels.

PROJECT GOAL

To maximize the effectiveness of trout stocking programs in Idaho.

OBJECTIVES

1. Describe growth, returns and cost per fish in the creel for fingerling and catchable-size rainbow trout in select put-grow-and-take waters statewide.
2. Describe relationships among lake and reservoir characteristics and performance of stocked rainbow trout.
3. Describe general characteristics of successful fingerling rainbow trout stocking programs.
4. Describe relationships among lake characteristics, angling effort, stocking rate, growth and return of stocked fingerling and catchable-size rainbow trout.
5. Develop stocking guidelines for put-grow-and-take rainbow trout fisheries in Idaho lakes and reservoirs.
6. Develop hatchery fish evaluation guidelines for lakes and reservoirs.
7. Develop methods to improve return to creel in put-and-take stream fisheries.

STUDY AREA

From 1992-1995 we evaluated fingerling and catchable stocking programs on nine lakes and reservoirs including two trophy waters, Daniels and 24-Mile reservoirs (Figure 1). We also compiled data from regional fisheries personnel for evaluations on another nine waters. These waters represent a broad range of conditions (productivity, habitat, species composition, and angling intensity).

Return to creel comparisons of "bait-trained" and untrained put-and-take rainbow trout were conducted on Rock Creek (Twin Falls County) and Little Smoky Creek (Camas County) (Figure 2).

METHODS

Fingerling-Catchable Tradeoffs

Stocking evaluations were continued on Magic and Little Wood reservoirs in 1995. For each of these evaluations, we collected or compiled information on:

1. Size, number, and date stocked for each plant.
2. Angling effort, cumulative return, and contribution to the creel.
3. Growth and condition of fish after release.
4. Lake productivity and fish species composition.
5. Zooplankton species composition and size structure.
6. Reservoir water levels.
7. Useable trout habitat in each study water.

Stocking data for each study water are provided in Table 1. Methods for stocking, conducting creel censuses and return estimates, assessing growth and condition of planted fish, and defining lake and reservoir characteristics are described in Dillon and Alexander (1995). In 1995, sampling intensity for trout growth, limnology, and zooplankton data was reduced from monthly (May-October) to bi-monthly (May, July, and September).

Analysis

We used correlation analysis to initially examine relationships among variables representing lake productivity, water levels, angling effort, fish community, trout growth, and return rates. Those variables correlated with a chosen dependent variable (e.g. growth, return to creel) were used in regression analysis to test for relationships among lake characteristics and return data for each stocked group. We used Fisher's exact test to test relationships between zooplankton size structure and trout stocking success.

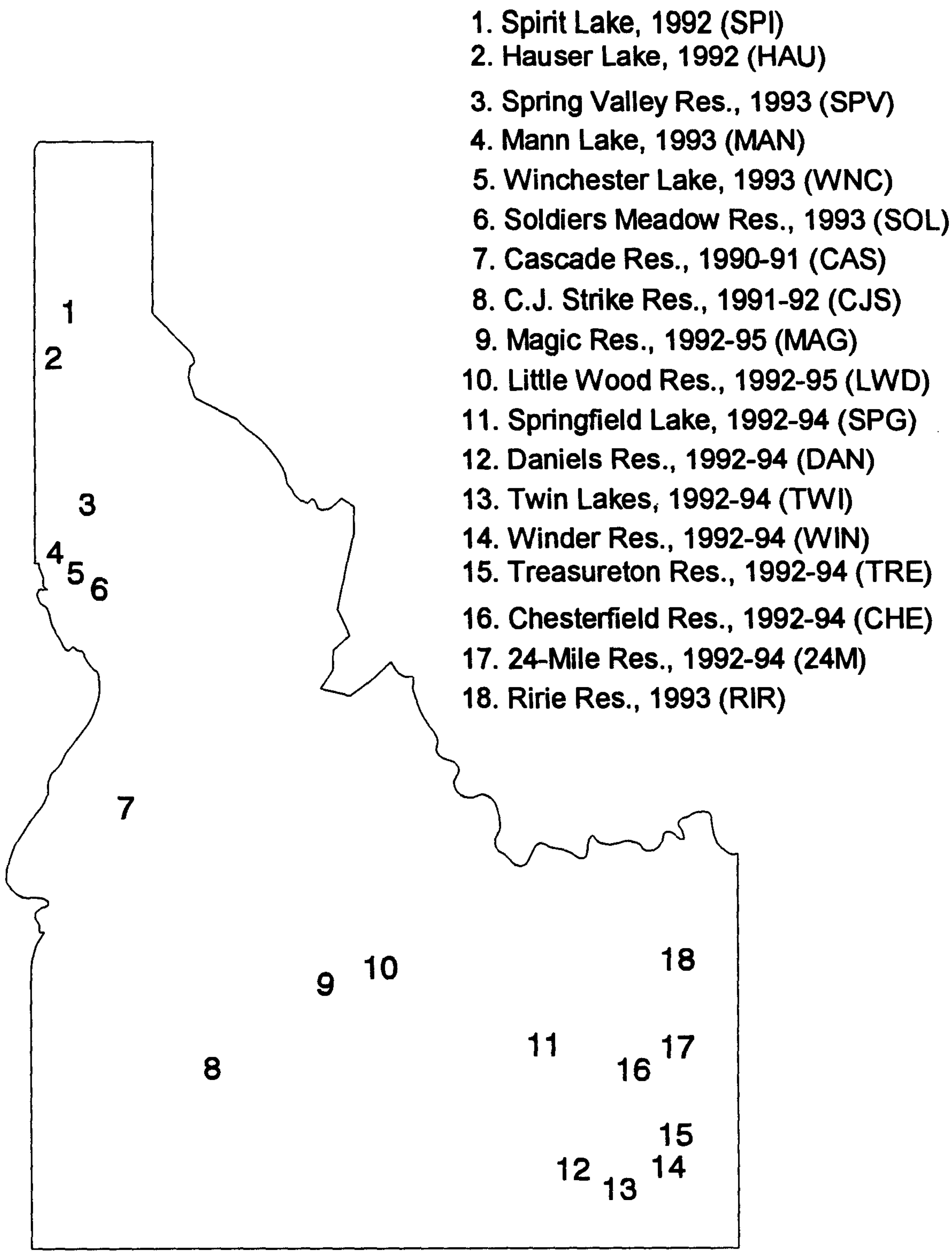

Figure 1. Locations and years of study waters with fingerling/catchable evaluations. Abbreviations (in parentheses) to be used in subsequent tables and figures.

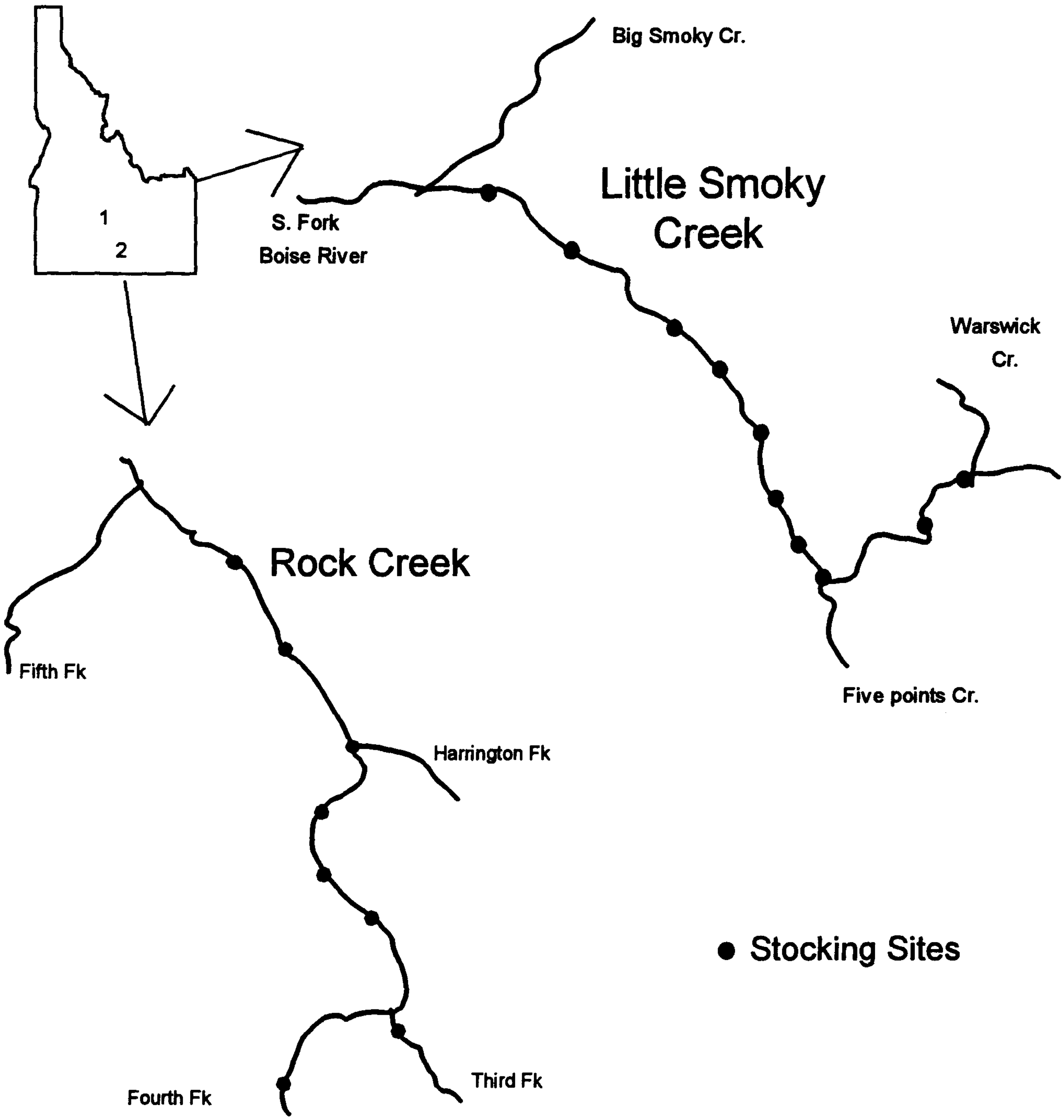

Figure 2. Locations of Little Smoky Creek and Rock Creek, and stocking sites for bait-trained and untrained hatchery catchable rainbow trout.

Table 1. Rainbow trout stocking data for 18 Idaho waters with fingerling-catchable stocking evaluations (IDFG hatchery records).

Location	Year	Number of catchables stocked	Date	Mean length lmm)	ID mark[a]	Number of fingerlings stocked	Date	Mean length lmm)	ID mark[a]
Spirit Lake	1992	7,000	4-6/92	243	AC	45,000	10/92	136	NM
Hauser Lake	1993	9,000	4-6/92	243	AC	18,000	10/92	136	NM
Spring Valley Reservoir	1992					11,370	9/92	163	NM
	1993	45,000	4-10/93	250	NM	20,000	6/93	75	NM
Mann Lake	1993	42,290	4-10/93	250	NM	45,000	6/93	75	NM
Winchester Lake	1992	-	-	--		23,812	9/92	152	NM
	1993	42,288	4-10/93	250	NM	30,000	6/93	82	NM
Soldiers Meadow Reservoir	1993	15,070	4-10/93	250	NM	25,000	6/93	75	NM
Cascade Reservoir	1990	--	--	--	--	169,000	9/90	165	LV
	1991	150,000	6/91	250	RM	396,300	9/91	163	NM
	1992	115,800	6/92	250	--				
C.J. Strike Reservoir	1991	--	--	--	--	26,390	12/91	140	NM
	1992	--	--	--	--	7,875	3/92	203	NM
Magic Reservoir	1992	33,850	5/92	224	LM	201,400	4/92	83	NM
	1993	36,400	5/93	221	RM	387,050	4/93	120	AC
						216,345	10/93	131	NM
	1994	24,975	5/94	201	LM	50,170	9/94	123	AC
	1995	33,900	4/95	254	NM	315,338	5/95	89	NM
						213,310	9/95	107	NM
Little Wood Reservoir	1992	7,600	4/92	229	LM	54,000	4/92	80	NM
	1993	10,113	5/93	250	RM	45,600	5/93	78	NM
						54,000	10/93	125	AC
	1994	10,000	5/94	253	LM	59,901	5/94	78	NM
						10,000	9/94	127	AC
	1995	5,000	7/95	262	RM	42,700	7/95	135	NM
						25,200	**9/95**	165	NM

Table 1. Continued.

Location	Year	Number of catchables stocked	Date	Mean length (mml	ID mark'	Number of fingerlings stocked	Date	Mean length (mml	ID mark'
Springfield Lake	1992	3,073	2/93	264	AC	25,008	10/92	157	NM
		2,000	5/92	239	AC	--	--	--	--
		1,680	6/92	244	AC	--	--	--	--
	1993	8,500	5/93	254	LM	25,000	10/93	160	NM
	1994	4,690	5/94	240	RM	25,000	10/94	160	NM
Daniels Reservoir	1992	4,690	3/92	196	AC	15,829	9/92	162	NM
	1993	4,688	5/93	229	LM	15,951	10/93	127	NM
	1994	4,690	5/94	218	RM	15,900	10/94	165	NM
Twin Lakes	1992	11,076	5/92	244	AC	37,630	9/92	163	NM
	1993	11,141	5/93	229	LM	37,637	9/93	152	NM
	1994	11,150	5/94	230	RM	--	--	--	--
Winder Reservoir	1992	13,198	5/92	241	AC	9,944	9/92	160	NM
	1993	2,349	5/93	229	LM	6,450	9/93	127	LM
	1994	2,350	5/94	230	RM	--	--	--	--
Treasureton Reservoir	1992	15,960	5/92	239	AC				
	1993	16,002	5/93	229	LM	54,060	9/93	152	NM
	1994	1,200	5/94	230	RM	--	--	--	--
Chesterfield Reservoir	1992	20,000	3/92	193	AC	134,995	9/92	160	NM
	1993	39,995	5/93	229	LM	129,850	9/93	165	NM
	1994	40,000	5/94	230	RM	--	--	--	--
24-Mile Reservoir	1992	1,136	5/92	244	AC	1,859	9/92	160	NM
	1993	550	5/93	229	LM	1,860	9/93	152	NM
	1994	550	5/94	230	RM	1,860	9/94	165	NM
Ririe Reservoir	1992					162,530	3-4/92	134	NM
	1993	12,019	4/93	305	NM	--	--	--	--

AC = adipose clip; NM = not marked; LV = left ventral clip; RV = right ventral clip; RD = red dye mark; OD = orange dye mark; GD = green dye mark; RM = right maxillary clip; LM = left maxillary clip.

Trophy Trout Evaluations

In addition to routine sampling for growth and condition data, in June 1995 we attempted to estimate survival of fish stocked in previous years in Daniels Reservoir. Daniels has a 20-in (508 mm) minimum length regulation. We assumed, therefore, that none of the fish planted in May 1995 (235 mm) and September 1994 (127 mm) were legally harvested prior to our sampling. Also, few or none of the 1992 or 1993-stocked fish were of legal size in June 1995. Abundance of these stocked groups should primarily reflect natural and catch-and-release hooking mortality over the previous 1.5 to 3 years.

From June 6-23, 1995 we conducted a mark-recapture population estimate for stocked trout in Daniels Reservoir. To test assumptions of random mixing we stratified the reservoir into three sections and delineated the sections with buoy lines in the reservoir (Figure 3). From June 6-16, we collected and marked fish using nighttime pulsed DC electrofishing along the shoreline and daytime purse seining in open water. The purse seine net was 3.05 m x 152 m with 6.4 mm mesh. For each net set or electrofishing run we recorded the section sampled. Captured fish from the various stocked groups were identified from fin or maxillary clips, measured, and differentially marked to designate capture gear and location (Table 2). All marked fish were released in the same section from which they were captured. We held a sample of captured fish from each gear type in a live cage overnight to assess short-term capture and handling mortality.

The recapture event took place June 19-23 using the same gears. We recorded gear type, lake section, and lengths and marks of all fish sampled. We gave each fish an additional mark so it would not be recorded more than once during the recapture event.

We plotted cumulative length frequencies for the marking and recapture events for both gear types, and used a two-sample Kolmogorov-Smirnov test to test for size selectivity among events for each gear. To test assumptions of random mixing for individual and combined gears, we constructed contingency tables to assess recapture ratios for each lake section. We used Chi-square analysis to test for equal probability of capture across lake areas and gear types.

For comparative purposes, we used four approaches to estimate total abundance. We calculated separate estimates for electrofishing and purse seine data using Chapman's modification of the Petersen model (Ricker 1975). We then combined mark-recapture data from both gears, and used the modified Peterson model to derive an overall estimate. Because there was only partial mixing in the combined-gear recaptures, we then used the methods described by Darroch (1961) to estimate the total population with data from both gears combined. We used a bootstrap technique (Efron 1982) to estimate variance and statistical bias (Bernard and Hansen 1992). For each population estimate, we estimated standing stock using the mean fish weight from the electrofishing, purse seine, or combined catch.

For 1994 fall fingerlings and 1992/1993 fall fingerlings (combined), we estimated abundance with the Ricker (1975) model based on mark and recapture data within stocking group and gear. We expressed survival through June 1995 for 1994 fall fingerlings as a percentage of the number stocked. Recapture rates in the remaining stocked groups were too low for individual population and survival estimates.

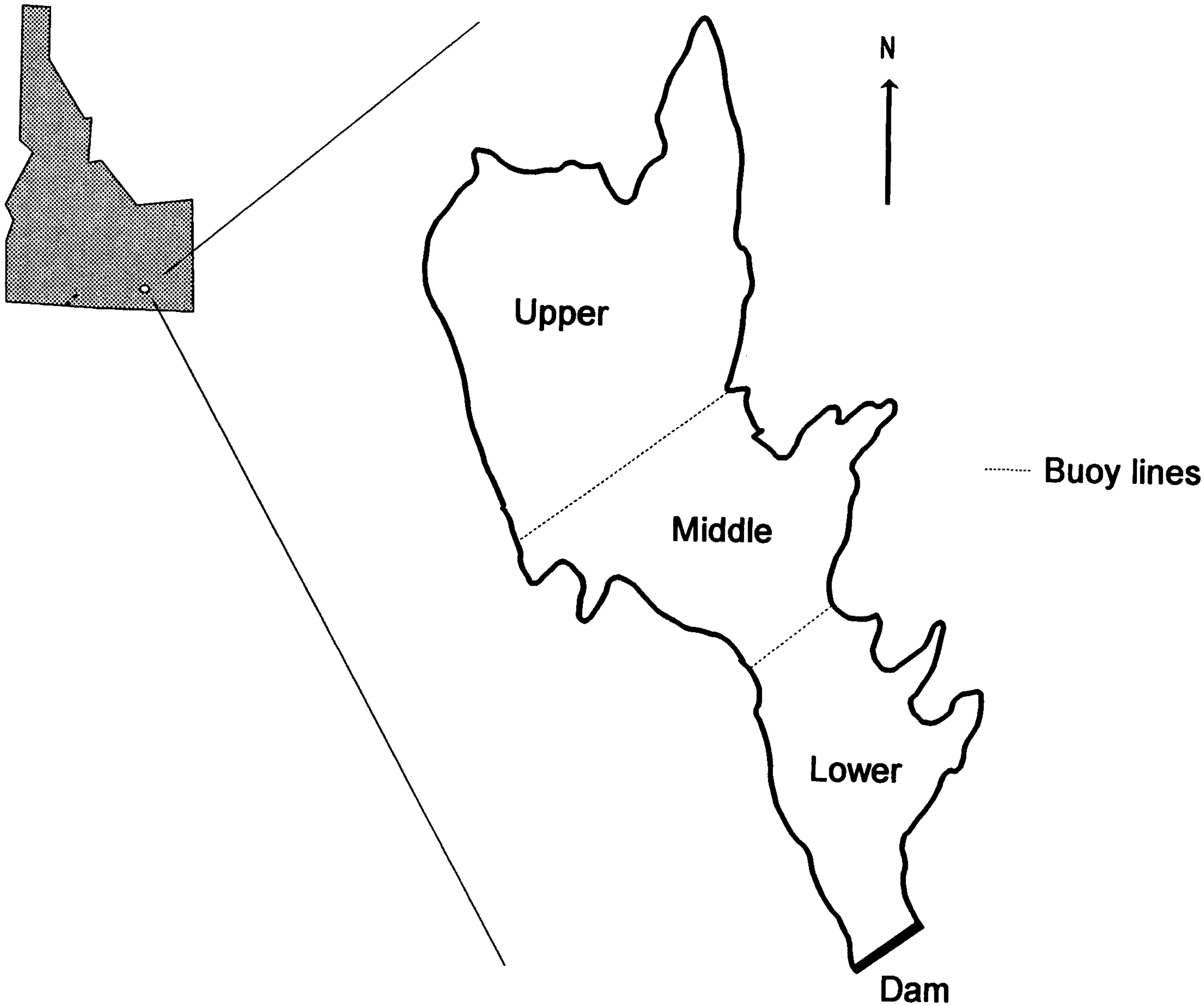

Figure 3. Location of Daniels Reservoir and sections delineated with buoy lines during population estimates, June 1995.

Table 2. Marks used to designate capture gear and reservoir section for purse seining and electrofishing in Daniels Reservoir, June 1995.

	Marks[a] by Reservoir Section		
Gear	Lower	Middle	Upper
Purse Seine	LC	MC	UC
Electrofishing	LC, RP	MC, RP	UC, RP

[a] LC = lower caudal fin punch, MC = middle caudal fin punch, UC = upper caudal fin punch, and RP = right pelvic fin punch.

Table 3. Mark-recapture data for population estimates on Daniels Reservoir, June 1995.

Gear	Stocked group	Total Marked	Total Captured in Recapture Event	Total Recaptures
	'92 & '93 Fall Fingerlings	100	84	7 (1)[a]
	'93 Catchables	11	4	0
	'94 Catchables	79	28	0
	'94 Fall Fingerlings	75	45	6
	'95 Catchables	78	26	5 (1)[a]
	Hybrids (<350 mm)	9	5	0
	Hybrids (>350 mm)	48	13	1
	Wild	0	2	0
Electrofishing	'92 Catchables	13	22	1
	'92 & '93 Fall Fingerlings	69	168	14 (5)[b]
	'93 Catchables	31	17	5 (1)[b]
	'94 Catchables	30	46	1 (1)[b]
	'94 Fall Fingerlings	29	35	4 (2)[b]
	'95 Catchables	19	28	5 (3)[b]
	Hybrids (<350 mm)	0	1	0
	Hybrids (> 350 mm)	19	34	2
	Wild	30	33	7
Total		642	591	58

[a] Number in parentheses indicates fish marked by electrofishing and recaptured by purse seining.
[b] Number in parentheses indicates fish marked by purse seining and recaptured by electrofishing.

Tests for Increasing Returns in Streams

In August 1995, Hayspur strain hatchery catchables at Hagerman State Fish Hatchery were divided into two adjacent raceways. We designated one raceway as control fish, and one as experimental fish. Control fish were hand-fed a full ration of standard pelletized food. During the training, experimental fish were hand-fed at 50% of full ration in addition to the bait items, and were fed full rations of pellets between training experiments.

Training took place in two phases. For five days (August 6-10) we fed four pounds of night crawlers per day to the experimental group. We purchased the night crawlers from a commercial distributor and cut them into small pieces for feeding. Both experimental and control fish were held off feed for 24 h prior to stocking. On August 11 we measured, jaw-tagged, and stocked 250 trained and 250 control fish each into Rock Creek (Twin Falls County) and Little Smoky Creek (Camas County). Jaw tags were sequentially numbered and allowed identification of individual stocked groups.

The second training phase took place August 20-24. Experimental fish were hand-fed a combination of night crawlers, canned whole kernel corn, and salmon eggs. We measured, jaw-tagged, and stocked 250 trained and 250 control fish into both streams on August 25.

We posted signs along both streams and submitted a press release soliciting tag returns. We also attached tear-off data slips at each streamside sign post for anglers to record the date and location of catch. As an incentive to return tags, for both streams we offered a drawing wherein each tag submitted by an angler provided one chance at a $100, $75, or $50 gift certificate from a local sporting goods retailer. We requested that all tags be submitted by September 30, and held the drawing on October 16. We randomly selected the six tags by matching numbers from a random number table (Zar 1984) to jaw tags returned from each stream.

We used jaw tag return data to assess timing of returns and total returns for each stocked group. We entered tag data into a database which included stream, tag number, date caught, and the angler's name, address and phone number. If anglers provided incomplete information, the data were not used in our analysis, but the names were still included in the gift certificate drawing list. We plotted cumulative returns against dates to describe the timing and total returns for trained and control groups in both streams. We used Chi-square analysis to test for significant differences in return between trained and untrained fish in individual stocking events, and used a paired T test to test overall differences in returns. Because we sought only to describe relative returns among trained and control fish in the same stream, we did not attempt to correct the data for non-response bias.

RESULTS

Fingerling-Catchable Tradeoffs

With the addition of the 1995 data from Magic and Little Wood reservoirs, we now have evaluations of 30 catchable-size plants, 17 fall fingerling plants, and 9 spring fingerling plants.

Contribution to the Creel

Creel census effort estimates for each water are provided in Appendix A. Return estimates for each stocked group and water are provided in Appendix B.

In waters with multiple-year evaluations, returns of both fingerling and catchable-size fish were variable within years among lakes and within lakes among years. Through 1995, catchables met put-and-take return goals (40% by number) in 11 of 30 cases (Figure 4, Appendix B). However, most of these waters are considered put-grow-and-take, even for catchable-size fish. Using this criterion, return goals (100% by weight) were met in 5 of 25 cases with available data (Figure 5, Appendix B).

Through 1995, spring fingerlings met return goals for put-grow-and-take fisheries (100% by weight) in 5 of the 9 plants (Figure 6, Appendix B), while fall fingerlings met return goals in 5 of the 17 plants (Figure 7, Appendix B).

For lakes with available data, cost per kg to the creel was also highly variable for all three size groups. For catchable-size plants, cost per kg of harvested fish ranged from $1.54 in Treasureton Reservoir (1993 plant) to over $427 in Springfield Lake (1993 plant) (Appendix C). Spring fingerling cost per kg ranged from $0.51 in Little Wood Reservoir (1993 plant) to $90 in Mann Lake (1993 plant). Fall fingerlings cost per kg ranged from $0.85 in Chesterfield Reservoir (1993 plant) to $446 in Magic Reservoir (1994 plant).

Growth and Condition

In the multiple-year study waters, growth of catchables was poorer in the drought year of 1994 than in the high water years of 1993 and 1995 (Appendix D-1), probably reflecting reduced carrying capacities in the study waters during the drought year. Similar trends were observed for spring fingerlings (Appendix D-2) and fall fingerlings (Appendix D-3). Trends in condition generally followed those of growth. Relative weights remained high through September in high water years, but decreased through summer and fall in drought years (Appendix E).

Lake Characteristics

Available limnological data and species composition for each study water are presented in Appendix F. Not all limnological data were collected in each water and year. In the multiple-year study waters, basic indices of productivity (e.g., Secchi disk transparency) changed little from year to year, despite large interannual variation in water levels.

In most waters with year-to-year comparative data, zooplankton length-frequencies shifted to smaller sizes in the low water years of 1992 and 1994, compared to the high water years of 1993 and 1995 (Appendix G). Five waters (Spirit, Spring Valley, Mann, Soldiers Meadow, and Ririe) showed evidence of severe zooplankton cropping as evidenced by few or no specimens larger than 1.5 mm (Appendix H). Additional zooplankton samples from Winder, Treasureton, and Chesterfield reservoirs in 1993 and 1994 were not analyzed in time for inclusion in this report.

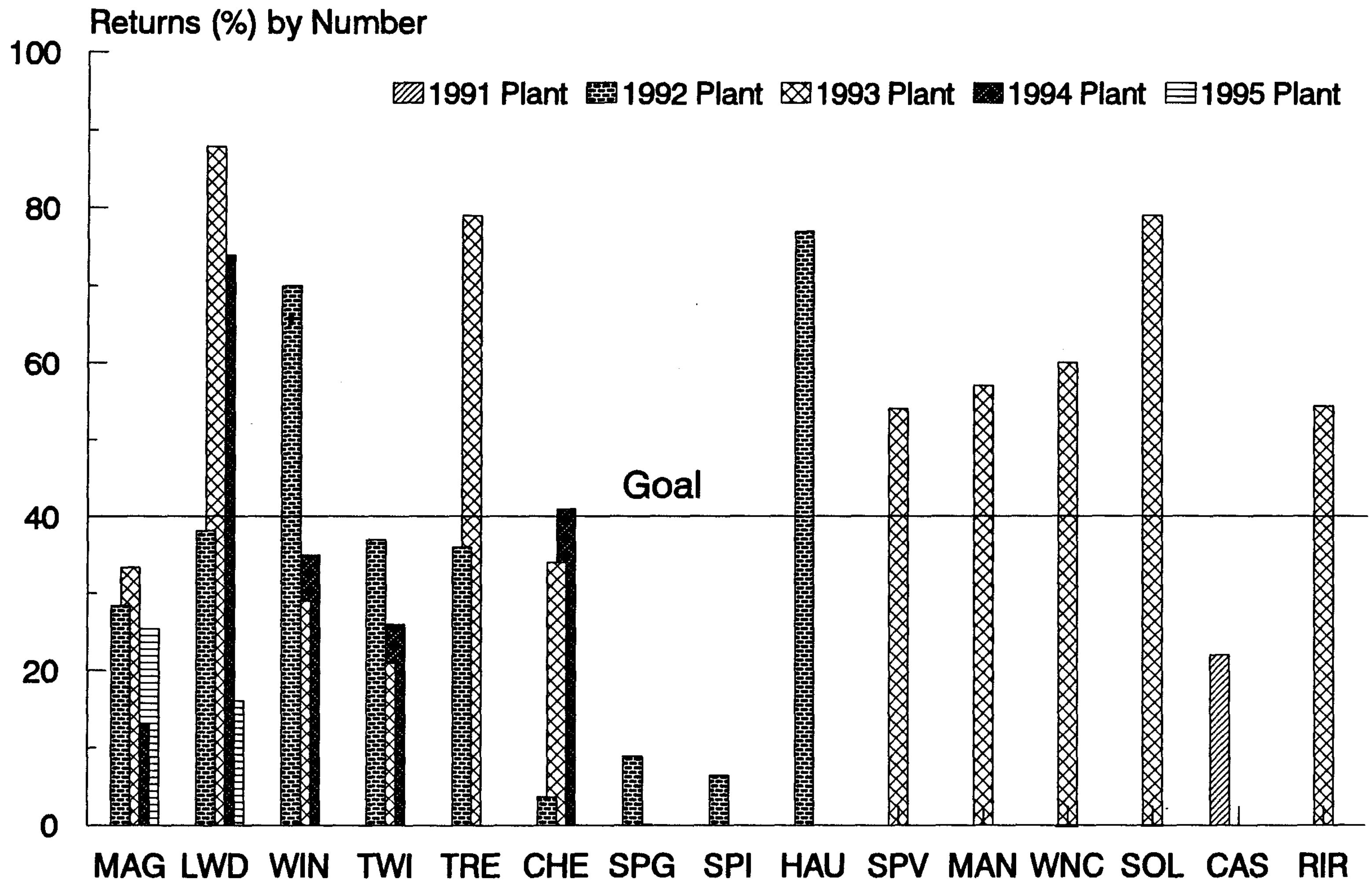

Figure 4. Returns of catchable rainbow trout in 15 Idaho lakes and reservoirs, 1991-1995.

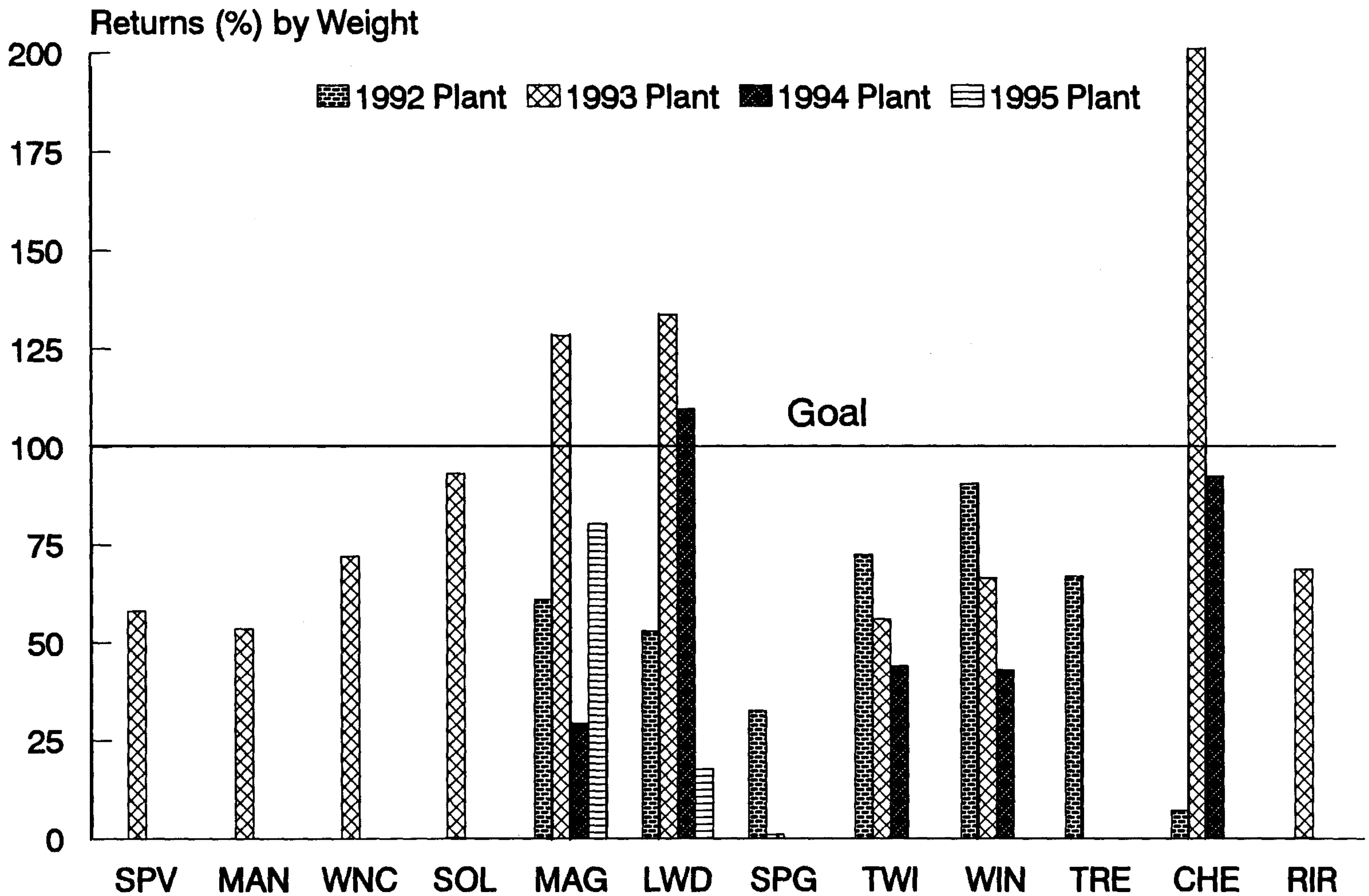

Figure 5. Weight returns of catchable-size rainbow trout in 12 Idaho lakes and reservoirs through 1995.

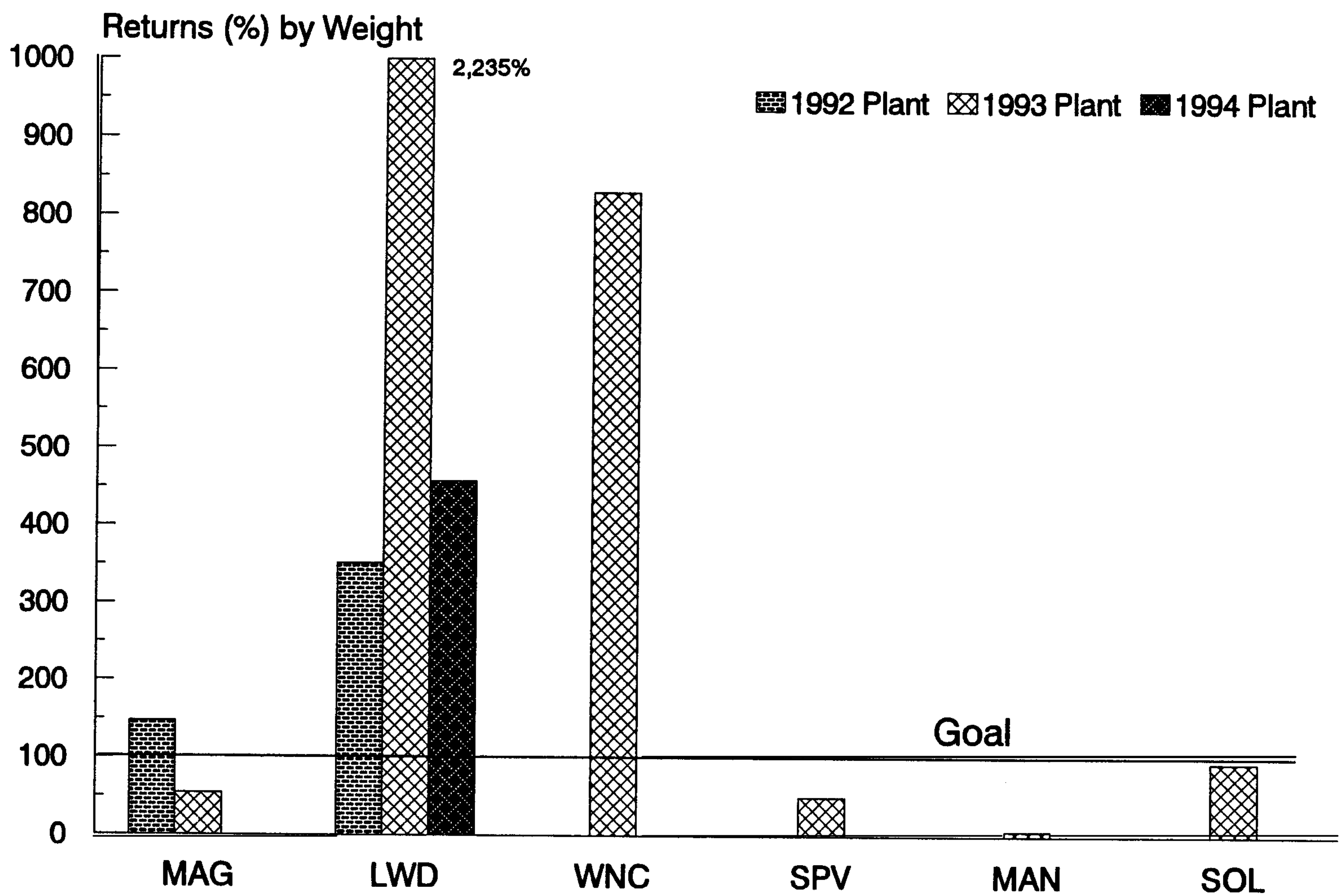

Figure 6. Weight returns for spring fingerling rainbow trout in six Idaho lakes and reservoirs, 1992-1994.

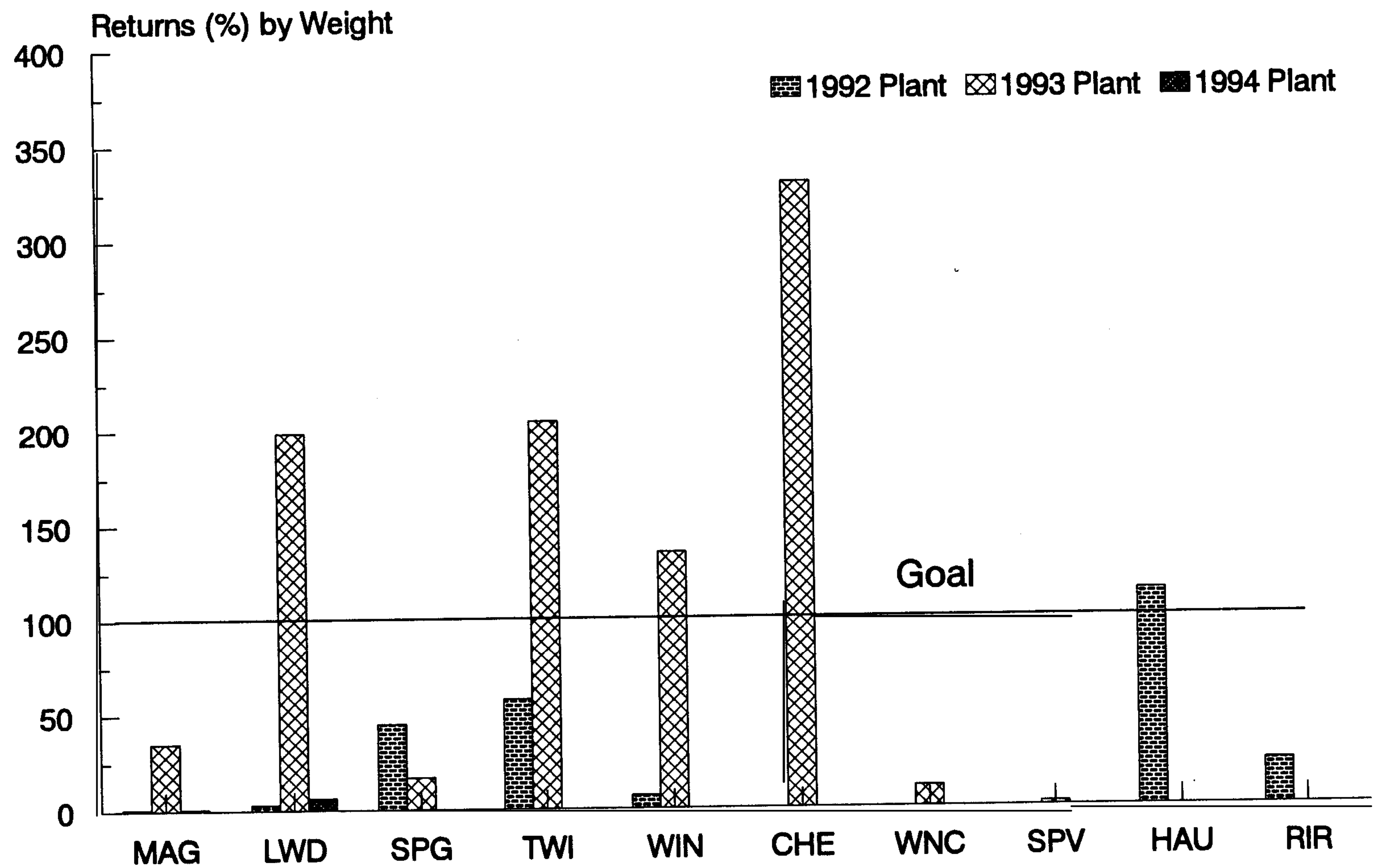

Figure 7. Weight returns for fall fingerling rainbow trout in ten Idaho lakes and reservoirs.

As in 1993 and 1994, useable trout habitat (UTH) was not a limitation to most of the fisheries with available data, i.e. most contained water 19^0C with dissolved oxygen z 5 mg/liter (Appendix I).

Analysis

With the current data set, there were few significant correlations among lake productivity, species composition, angling effort, fish growth, or return variables. The categorical variable reflecting water level at the time of stocking was positively correlated with returns for fall fingerlings. This was true for both numerical returns (R2 = 0.357, p = 0.015) and weight returns (R2 = 0.308, p = 0.032). Although these relationships were statistically significant, water level at planting accounted for only a small portion of the total variability in returns. None of the other variables reflecting productivity, water levels or angling effort were significantly correlated with returns.

Zooplankton sampling effort and timing varied across the study waters, thus some samples were not directly comparable. Presence or absence of zooplankton z2.0 mm in July was significantly related to fall fingerling stocking success (Fisher Exact Test, p = 0.03). Fall fingerlings met return goals in five of the nine waters where zooplankton z2.0 mm were determined to be present the July prior to planting (Figure 8). In all seven cases where large zooplankton were absent in July, fall fingerling plants failed to meet return goals.

<u>Trophy Trout Evaluations</u>

We captured and marked a total of 642 fish during the marking event at Daniels Reservoir, 402 with daytime purse seining and 240 with nighttime electrofishing (Table 3). Although most stocked groups were identifiable by marks or length frequency, the 1992 and 1993 fall fingerlings could not be differentiated and were combined into one group for analysis. During the recapture event we captured 591 fish, 207 by purse seine and 384 by electrofishing (Table 3). Of these, 19 were recaptures by purse seine and 39 were recaptures by electrofishing, for a total of 58 recaptures.

Cumulative length frequencies for the marking event and for recaptured fish for each gear type are presented in Appendices J and K. Within gears, there were no significant differences in the cumulative frequencies, indicating no size selectivity within gears.

Within gear types, Chi-square analysis indicated random mixing (i.e. equal probability of capture) of marked fish among lake sections (Tables 4 and 5). There was, however, unequal mixing across sections when catches from both gears were combined (Chi-square, $p < 0.05$) (Table 6).

The point estimates for total population derived from the four approaches were considerably different; however, all had overlapping 95% confidence limits (Table 7). The Petersen estimate with the combined-gear data was 6,450 fish. This estimate was 46% higher than previous estimates using only electrofishing data (Dillon and Alexander 1995). The Darroch point estimate (7,390) was higher than the combined-gear Petersen estimate.

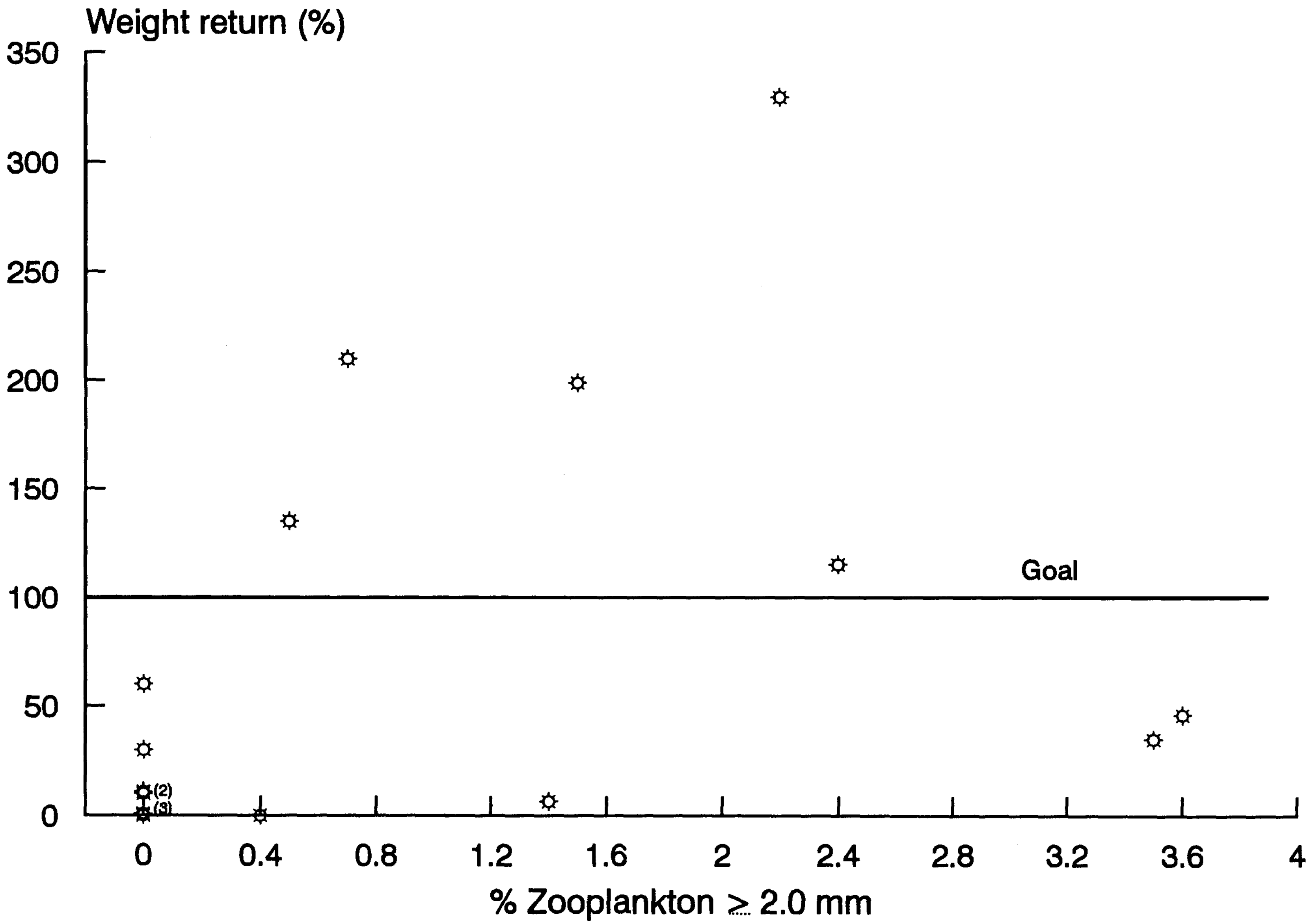

Figure 8. Relationship of July zooplankton size structure to fall fingerling rainbow trout weight returns in 16 Idaho lakes and reservoirs.

Table 4. Electrofishing mark-recapture data used to test assumptions of random mixing between marking and recapture events on Daniels Reservoir, June 1995.

Reservoir section	Number marked	Number recaptured
Upper	53	2
Middle	67	9
Lower	120	13

Table 5. Purse seine mark-recapture data used to test assumptions of random mixing between marking and recapture events on Daniels Reservoir, June 1995.

Reservoir section	Number marked	Number recaptured
Upper	240	6
Middle	82	5
Lower	80	6

Table 6. Combined electrofishing and purse seine mark-recapture data used to test assumptions of random mixing between marking and recapture events on Daniels Reservoir, June 1995.

Reservoir section	Number marked	Number recaptured
Upper	293	17
Middle	149	20
Lower	200	21

However, the bootstrap method to estimate variance (1,000 iterations) included 652 impossible capture probabilities (612 where $p < 0$ and 40 where $p > 1$). The resulting standard error was nearly twice the point estimate for population size. This suggests some statistical bias in the estimate; the majority of negative probabilities indicates the Darroch method provided an overestimate (Bernard and Hansen 1992).

Standing stock estimates varied in accordance with the population estimates (Table 7). For the combined gear and Darroch methods, the point estimates were about twice as high as previous estimates by electrofishing only (Dillon and Alexander 1995).

Of the total rainbow trout catch (n = 891; mark and recapture events combined), 284 (32%) were from catchable-size plants and 607 (68%) were from fall fingerling plants.

Only two groups of fish provided enough recaptures to calculate separate abundance estimates. For the combined 1992 and 1993 fall fingerlings, we had 5 purse seine recaptures and 9 electrofishing recaptures (counting only fish marked and recaptured with the same gear). Total recaptures from this group, including fish marked with one gear and recaptured with the other, were 19 fish. The purse seine estimate was 1,445 fish, the electrofishing estimate was 1,183 fish, and the combined estimate was 2,163 fish.

For 1994 fall fingerlings, we had 7 recaptures by purse seine and only 3 by electrofishing. The purse seine estimate was 447 fish and the combined estimate was 766 fish. Based on these point estimates, of the 4,690 fall fingerlings stocked in October 1994, only 9.5% to16.3% survived the eight months to June 1995. This is similar to previous seven- to eight-month survival estimates for 1992 and 1993 fall fingerlings in Daniels Reservoir (Dillon and Alexander 1995).

Tests for Increasing Returns in Streams

Length frequencies for each group of rainbow trout stocked in Little Smoky and Rock creeks are provided in Appendix L. Total return rates for all stocked groups were low. Of the 1,000 tagged fish stocked in each stream, 105 tags (10.5%) were returned from Rock Creek and 206 (20.6%) from Little Smoky Creek (Table 8). Of the 311 tags returned, 172 were from trained fish and 139 from untrained fish.

In the first phase (worm-training) total tag returns for trained fish were higher than for untrained fish in both streams (Figure 9), but the differences were not significant (Chi-square; $p > 0.10$). The timing of returns was variable. In Little Smoky Creek, most of the differential return occurred in the first three days after planting. In Rock Creek, the first three day's returns were similar, but trained fish returned at a slightly higher rate thereafter.

In the second phase (worm-, corn-, and salmon egg-trained), total tag returns were similar for trained and untrained groups in both streams (Chi-square; $p > .10$), and the timing of returns was also variable (Figure 10).

The paired T analysis of the four comparisons indicated significantly better overall returns ($p = 0.095$) for the trained groups.

Table 7. Population and standing stock estimates derived from electrofishing data, purse seine data, and combined-gear data from Daniels Reservoir, June 1995.

Method	Gear	Population Estimate	95% Confidence Interval	Mean Weight (g)	Estimated Standing Stock(kg/ha)
Petersen	Purse Seine (PS)	4,655	2,699-6,611	529	16.42
	Electrofishing (EF)	3,710	2,391-5,029	602	14.89
	PS and EF combined	6,450	4,974-7,926	556	23.91
Darroch	PS and EF combined	7,390	4,881-9,899	556	27.39

Table 8. Tag returns of bait-trained and untrained put-and-take rainbow trout in Rock Creek and Little Smoky Creek, 1995.

Location		Number Stocked	Date	Total Tag Returns
Rock Creek	Trained[a]	250	8/11	43
	Untrained	250	8/11	31
	Trained[b]	250	8/25	17
	Untrained	250	8/25	15
Little Smoky Creek	Trained°	250	8/11	68
	Untrained	250	8/11	49
	Trained[b]	250	8/25	50
	Untrained	250	8/25	47

[a] Trained with worms.
[b] Trained with worms, salmon eggs, and corn.

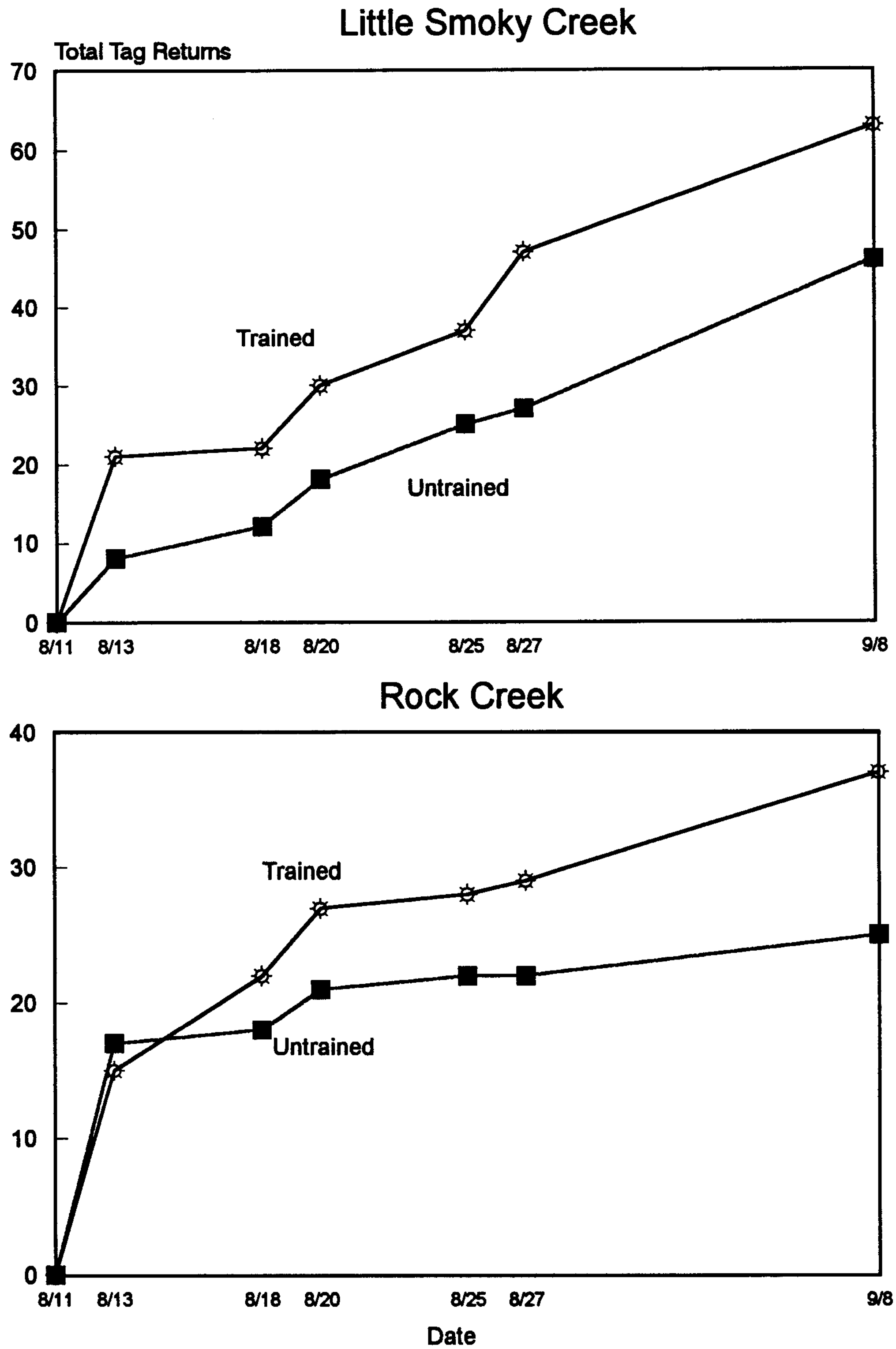

Figure 9. Cumulative returns of food-trained rainbow trout from the first stocking of Little Smoky Creek and Rock Creek on August 11, 1995.

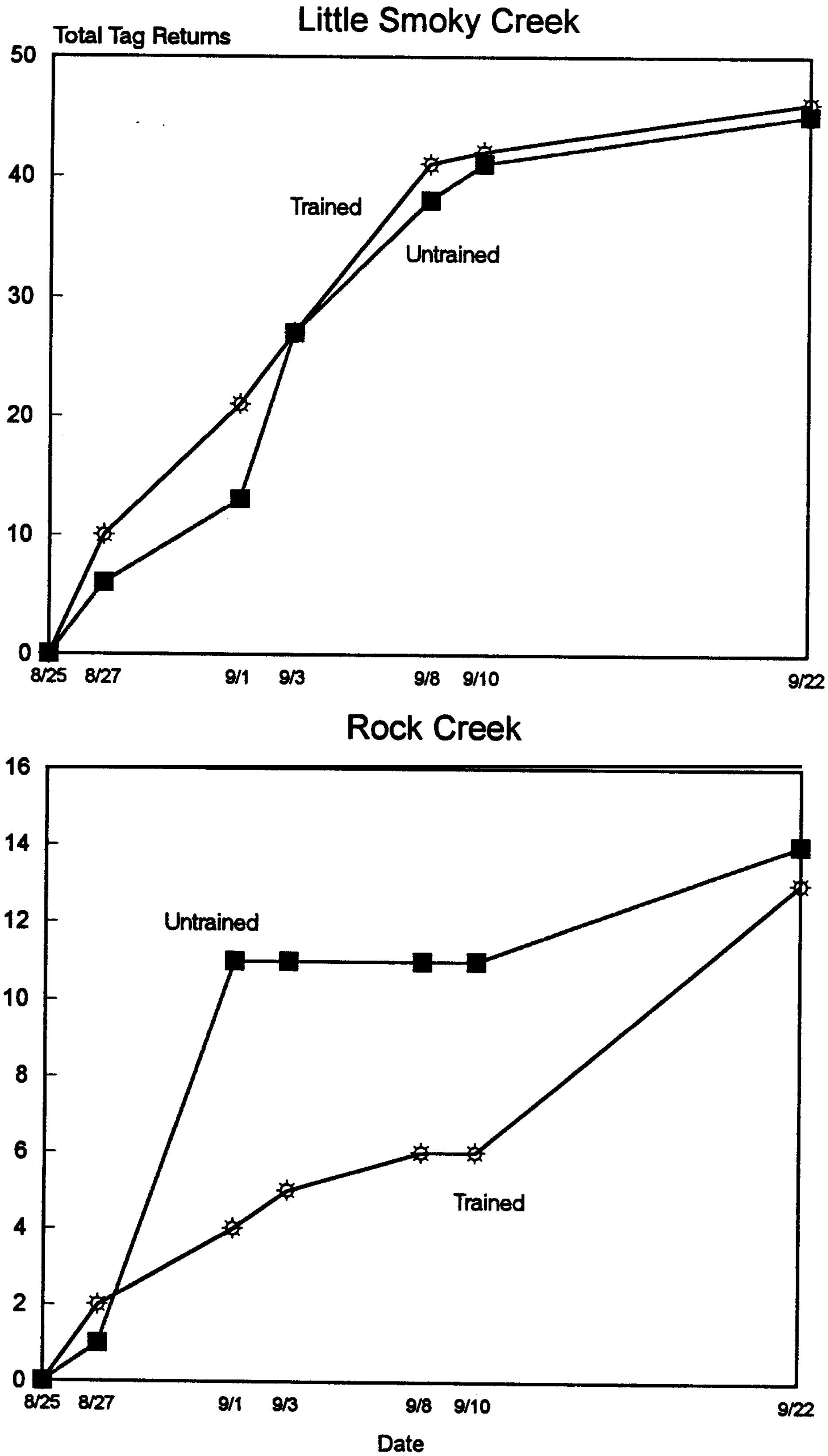

Figure 10. Cumulative returns of food-trained rainbow trout from the second stocking of Lit Smoky Creek and Rock Creek on August 25, 1996.

DISCUSSION

Fingerling-Catchable Evaluations

This report documents the fourth year of a long-term study. The fluctuating water years of 1992-1995 have made it difficult to identify trends or relationships between lake characteristics and stocking success, or to develop statewide stocking guidelines for put-and-grow trout. Although we present preliminary results and recommendations herein, we anticipate continuing evaluations through 1997, at which time a comprehensive analysis will be completed and further recommendations developed.

The relationship between zooplankton size structure and fall fingerling stocking success has potential as a management tool. The three of four cases where fall fingerlings were unsuccessful, despite the presence of large zooplankters, were Magic Reservoir (1993 plant) and Springfield Lake (1992 and 1993 plants). The circumstances in these two locations were unique. The 1993 fall fingerlings survived well in Magic Reservoir and comprised about half of the 1994 harvest. Due to drought in 1994, however, the reservoir was nearly drained by late summer. Sampling below the reservoir indicated many fish were lost by entrainment. Under better water conditions, this plant would likely have met return goals.

Springfield Lake has had poor returns of all catchable and fingerling plants since 1992, despite the availability of large zooplankton and macroinvertebrate prey (Dillon and Jarcik 1994; Dillon and Alexander 1995). Poor returns are probably not related to water quality or forage; the few harvested fish show remarkable growth (Dillon and Jarcik 1994). Predation by migratory birds (predominantly cormorants) could account for most of the catchable losses (IDFG unpublished data). Many of the fall fingerlings apparently move up into the spring inlets shortly after stocking and remain there all winter. This may make them vulnerable to predation and starvation (Dick Scully, IDFG, personal communication).

In the absence of mitigating factors such as those described above, July zooplankton size structure is probably the best available predictor of fall fingerling stocking success. We recommend a sampling protocol of three sites x three pulls/site. The three sites help account for potential spacial differences in zooplankton distribution. Unless quantitative data are needed, the samples can be pooled prior to measurements, minimizing the time for analysis. When zooplankton z 2.0 mm are absent, fall fingerlings are unlikely to meet return goals.

A simplified approach to assessing zooplankton size structure would be to use two plankton nets with different mesh sizes, one a standard (153 micron) mesh and one with larger (e.g. 500 micron) mesh (Dan Yule, Wyoming Game and Fish Department, personal communication). Relative volume of "large" versus total zooplankton could be quickly assessed. In the next year we will develop this approach and compare results to the more labor-intensive sampling and measuring protocol currently used.

Some trends were evident for spring fingerling stocking success. In general, waters with simple fish communities (one or two species other than trout - e.g. Little Wood, Winchester) had higher spring fingerling returns than those with more complex communities. Lakes with abundant potential predators or competitors (Mann, Spring Valley, Elk Creek, Cascade) had the poorest returns. Because we have evaluated only nine spring fingerling plants through 1995, new evaluations should focus primarily on waters with spring fingerlings plants. To further describe effects of fish community complexity, new evaluations should also include estimates of relative abundance for potentially competing or predatory species.

Trophy Trout Evaluations

With the exception of 1994 fall fingerlings, we were unable to estimate abundance and long-term survival of the individual stocked groups in Daniels Reservoir. The low estimated survival of the 1994 fall fingerlings to June 1995 (9.5% to 16.3%) is consistent with previous estimates for fall fingerlings in Daniels Reservoir (Dillon and Jarcik 1994; Dillon and Alexander 1995).

Combining two different gear types for the population estimate, and testing the assumptions of random mixing and size selectivity, provided insight into the validity of previous single-gear population estimates on Daniels Reservoir (Dillon and Alexander 1995). If we had used only electrofishing or only used purse seining mark-recapture data, our analyses would have indicated random mixing among reservoir sections and no size selection. This would have suggested either gear could provide an unbiased population estimate. However, mixing was unequal when catches from both gears were combined, suggesting unequal probability of capture from near shore to offshore areas. The point estimates for the combined-gear Petersen and the Darroch methods were considerably higher than the two single-gear estimates. Because there was unequal mixing of marked fish among gear types, gears which sample only the shoreline or only the open water would be inadequate for describing or enumerating the total population.

The Darroch estimate is the preferred approach when unequal mixing occurs (Bernard and Hansen 1992), but our Darroch estimate had some important limitations. The bootstrap technique for estimating variance generated a number of impossible capture probabilities, which indicates the overall estimate is seriously flawed (Bernard and Hansen 1992). The standard error of the estimate was larger than the point estimate. We believe this was the result of low frequencies in the raw data contingency table for capture probabilities.

Previous reports (Dillon and Jarcik 1994; Dillon and Alexander 1995) document trout growth, size structure, stocking and catch rates, and angling effort in Daniels and 24-Mile reservoirs. Both waters meet the size structure goal for trophy trout fisheries (z20% over 406 mm).

Although fall fingerling survival to the following spring in Daniels Reservoir appears to be poor, fingerlings comprised 68% of the total rainbow trout sampled during the population estimate. Long-term survival and growth of both fingerling and catchable-size plants are clearly adequate to meet management goals.

Tests for Increasing Returns in Streams

Our preliminary work suggests that catchability and returns of put-and-take hatchery trout can be enhanced by food or bait training. Although overall return of trained fish was higher than that of untrained fish, results were inconsistent among training events, and total tag returns were low for all experiments. Low tag returns were probably due in part to low angling effort at the time the experiments took place. It is unclear why results with worm-trained fish were better than with worm-, corn-, and salmon egg-trained fish.

Additional stocking experiments will be necessary to fully describe the potential benefits of bait training. Priority should be given to larger streams where short-term catchability may be more important. A paired T design with ten streams should be adequate to describe differences. We should also assess cost-effectiveness of such training as the differences are quantified.

CONCLUSIONS

The success of fall fingerling plants appears to be related to water levels and zooplankton size structure the year of stocking. In cases with extreme drawdown (i.e., drought years) and no zooplankton >2.0 mm, fall fingerling plants failed to meet return goals. Unless limited by predation, reservoir draining, or other unique events, fall fingerlings should meet return goals when zooplankton >2.0 mm are available the July prior to stocking.

Spring fingerlings are unlikely to provide acceptable returns in waters with complex fish communities, particularly where potential competitors or predators are abundant. We should continue to evaluate the relationship between fish community, zooplankton size structure and spring fingerling stocking success. New evaluations should include standard lowland lake surveys to describe relative abundance of predators and competitors.

Single-gear sampling is probably inadequate to enumerate trout populations in lakes and reservoirs. Gear selection for population estimates should be designed to sample all available habitats (e.g. littoral and pelagic). Population estimates in lakes and reservoirs should be designed so that the assumptions of mark-recapture experiments can be fully tested. Single-gear sampling should be adequate for routine population monitoring or collection of trend data.

Bait-training appears to have potential for improving returns of catchable trout in put-and-take stream fisheries. We should evaluate training in larger streams to further define the benefits and cost-effectiveness.

RECOMMENDATIONS

1. Use July zooplankton samples (3 sites x 3 pulls/site) to assess zooplankton size structure. Stock fall fingerlings only when large (22.0 mm) zooplankton are present the July prior to stocking. Develop simplified methods for assessing zooplankton size structure.

2. Unless evaluations show acceptable returns, do not use spring fingerlings where potentially competing or predatory species are present.

3. Continue building on the fingerling/catchable evaluation data base; include at least five new waters in 1996, with emphasis on waters with catchable-size and spring fingerling plants. Include bi-monthly (May, July, and September) samples of zooplankton size structure in conjunction with stocking evaluations.

4. Include standardized lowland lake surveys as part of stocking evaluations; incorporate relative abundance data for predators and competitors into future analyses.

5. Population estimates for trout in lakes and reservoirs should include gear types which sample both littoral and pelagic habitats. Population estimates should include assessments of size selection and random mixing so that the assumptions of mark-recapture experiments can be fully tested.

6. Test bait training in ten additional put-and-take streams to more fully describe potential benefits. Evaluate cost-effectiveness of bait training to improve returns.

ACKNOWLEDGMENTS

This research was funded by a Federal Aid in Sport Fish Restoration grant to the State of Idaho, Project F-73-R-18. Biological aides Dan Van Genechten and Glenda Claire assisted with field sampling, creel census and zooplankton analysis in 1995. Tom Frew, Bob Esselman, Rob Hill and Joe Chapman provided valuable input on hatchery operations in addition to manpower and technical support. Dean Rhine, Steve Elie, and Richard Scully reviewed earlier drafts of this report.

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A P P E N D I C E S

Appendix A. Creel census effort summaries for Idaho waters with fingerling-catchable stocking evaluations, 1991-1994.

Location	Year	Total effort (hrs)	Hours/hectare
Spirit Lake	1992	31,337	54
Hauser Lake	1993	35,392	240
Spring Valley Reservoir	1993	35,226	1,610
Mann Lake	1993	30,994	766
Winchester Lake	1993	43,030	1,418
Soldiers Meadow Reservoir	1993	14,973	366
Cascade Reservoir	1991-1992	206,465	17
C.J. Strike Reservoir	1991	238,248	78
Magic Reservoir	1992	60,716	300
	1993	52,242	57
	1994	71,656	358
	1995	47,617	39
Little Wood Reservoir	1992	14,929	250
	1993	18,074	89
	1994	26,601	443
	1995	54,653	230
Springfield Lake	1992	3,444	129
	1993	16,900	633
Daniels Reservoir	1993	41,173	271
	1994	27,229	180
Twin Lakes	1992	13,639	84
	1993	39,312	218
	1994	38,289	211
Winder Reservoir	1992	13,295	547
	1993	11,056	291
	1994	17,317	577
Treasureton Reservoir	1992	11,085	350
	1993	23,896	412
	1994	7,939	176
Chesterfield Reservoir	1992	5,903	35
	1993	28,589	44
	1994	150,151	359
24-Mile Reservoir	1993	7,627	380
	1994	4,571	229
Ririe Reservoir	1993	56,612	90

Appendix B. Cumulative returns by number and weight for hatchery rainbow trout in 14 Idaho lakes and reservoir, 1992-1995.

Water	Census Year	Stocked group	Number stocked	Weight stocked (kg)	1992	1993	1994	1995	Total
					Returns of percent number and (% weight) by year				
Spirit Lake	1992	'92 Catchables	7,000		6.4 (--)				6.4 (--)
Hauser Lake	1993	'90-'92 Fall fingerlings	20,000 /yr.	527.0/yr.		5.8(114.0)			5.8 (114.0)
	1993	'93 Catchables	9,000			77.6 (--)			77.6 (--)
Spring Valley Reservoir	1993	'92 Fall fingerlings	10,000	401.4		0.6 (1.8)			0.6 (1.8)
	1993	'93 Catchables	45,000	9,737.0		53.8 (58.0)			53.8 (58.0)
	1993	'93 Spring fingerlings	20,000	165.3		2.9 (49.5)			2.9 (49.5)
Mann Lake	1993	'93 Catchables	42,490	9,339.5					57.2 (53.5)
	1993	'93 Spring fingerlings	45,000	372.0					0.4 (6.7)
Winchester Lake	1993	'92 Fall fingerlings	10,000	378.0					3.6 (11.4)
	1993	'93 Catchables	42,288	8,285.0					60.5 (72.0)
Soldiers Meadow Reservoir	1993	'93 Catchables	15,070	2,490.0					78.9 (93.2)
	1993	'93 Spring fingerlings	25,000	206.0					9.3 (94.4)
Magic Reservoir	1992-95	'92 Catchables	33,850	3,773.0	27.7 (55.8)	0.7 (5.2)			28.4 (61.0)
	1992-95	'92 Spring fingerlings	201,400	1,682.0	3.1 (62.2)	0.7 (75.0)	0.1 (8.6)		3.9 (147.0)
	1992-95	'92 Fall fingerlings	97,345	1,955.0		0.1 (--)			0.1 (--)
	1993-95	'93 Catchables	36,400	4,000.0		28.0 (92.2)	5.3 (36.2)		33.4 (128.0)
	1993-95	'93 Spring fingerlings	387,050	3,284.0		0.5 (6.6)	0.6 (47.0)	0.01 (1.0)	1.1 (54.6)
	1993-95	'93 Fall fingerlings	50,868	1,841.0			5.5 (35.2)		5.5 (35.2)
	1993-95	'93 Fall fing. (private)	216,345	5,523.0			(57.3)		5.8 (57.3)
	1994-95	'94 Catchables	24,975	2,523.0			(25.8)	0.5 (3.6)	13.1 (29.3)
	1994-95	'94 Fall fingerlings	50,170	1,318.0				0.1 (1.0)	0.1 (1.0)
	1995	'95 Spring fingerlings	315,338	2,545.0				0.3 (4.3)	0.3 (4.3)
	1995	'95 Catchables	33,900	5,909.0				25.4 (80.3)	25.4 (80.3)
Little Wood Reservoir	1992-95	'92 Catchables	7,600	1,119.1	31.6 (37.6)	6.6 (15.3)			38.2 (52.9)
	1992-95	'92 Spring fingerlings	54,000	370.5		7.2(244.8)	1.6 (106.6)		8.8 (351.4)
	1992-95	'92 Fall fingerlings	15,000	285.5		0.3 (--)			0.3 (--
	1993-95	'93 Catchables	10,113	1,761.4		63.2 (77.1)	16.4 (42.9)	8.3 (13.7)	87.9 (133.8)
	1993-95	'93 Spring fingerlings	48,600	214.4		0.4 (7.5)	17.4 (1294.5)	11.8 (933.1)	29.7(2235.1)
	1993-95	'93 Fall fingerlings	54,000	1,140.0			9.9 (81.6)	11.8 (117.4)	21.7 (199.0)
	1994-95	'94 Catchables	10,000	1,761.4			62.4 (93.8)	11.6 (16.1)	73.9 (109.8)
	1994-95	'94 Spring fingerlings	59,901	390.0			0.8 (9.7)	16.7 (448.2)	17.5 (457.9)
	1994-95	'94 Fall fingerlings	10,000	226.4				1.4 (6.5)	1.4 (6.5)

Appendix B. Continued.

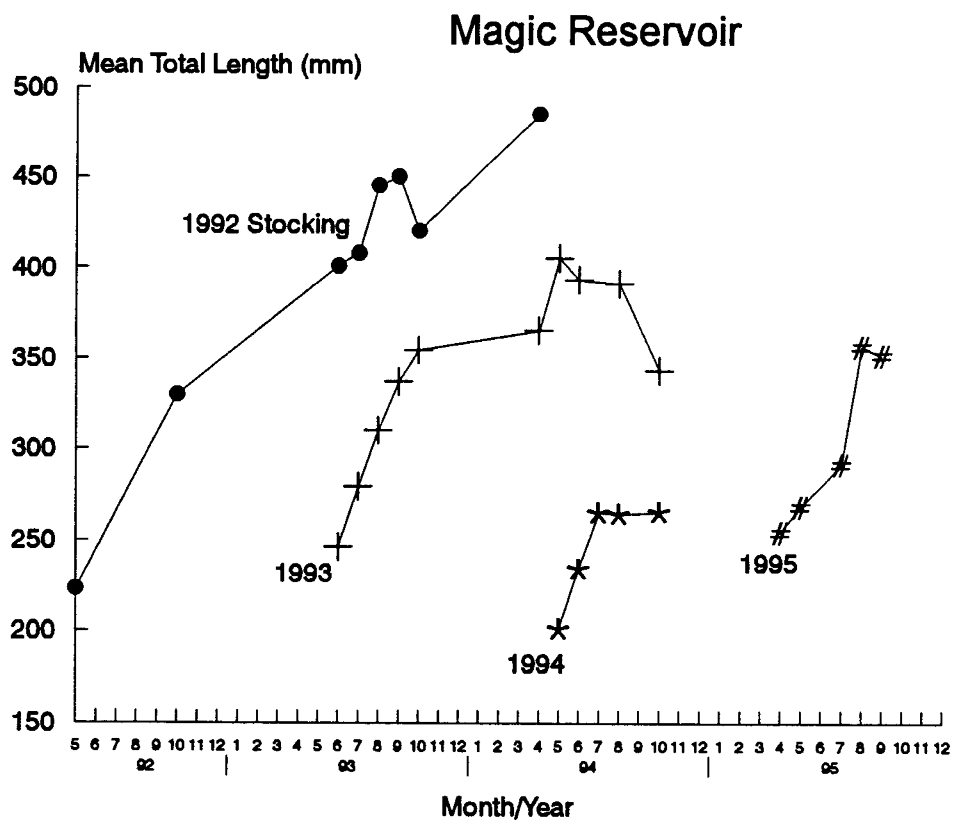
Water	Census Year	Stocked group	Number stocked	Weight stocked (kg)	1992	1993	1994	1995	Total
					Returns of percent number and (% weight) by year				
Little Wood (cont.) Reservoir	1995	'95 Catchables	5,000	1,000.0				16.1 (17.7)	16.1 (17.7)
Springfield Lake	1992-94	'92 Catchables	6,754	1,209.0	11.1 (22.0)	1.7 (10.5)			12.8 (32.5)
	1992-94	'92 Fall fingerlings	25,008	1,088.0		15.0 (45.0)	0.2 (3.5)		15.2 (48.5)
	1993-94	'93 Catchables	8,500	976.0		0.1 (1.1)			0.1 (1.1)
	1993-94	'93 Fall fingerlings	28,885	1,202.0			4.7 (17.0)		4.7 (17.0)
Twin Lakes	1992-94	'92 Catchables	11,076	1,769.0	13.0 (20.4)	24.0 (52.0)			37.0 (72.4)
	1992-94	'92 Fall fingerlings	37,630	1,782.0		8.4 (58.0)	3.2 (34.3)		11.6 (92.3)
	1993-94	'93 Catchables	11,141	1,247.0		11.0 (28.0)	9.9 (28.0)		20.9 (56.0)
	1993-94	'93 Fall fingerlings	37,637	1,388.0			25.8 (216.0)		25.8 (216.0)
	1994	'94 Catchables	11,150	1,247.0			26.3 (44.0)		26.3 (44.0)
Winder Reservoir	1992-94	'92 Catchables	13,198	2,052.0	60.6 (90.6)				60.6 (90.6)
	1992-94	'92 Fall fingerlings	9,944	460.0		0.6			0.6 (3.0)
	1993-94	'93 Catchables	2,349	263.0		25.0	3.9 (12.5)		28.9 (66.5)
	1993-94	'93 Fall fingerlings	6,450	195.0			17.0 (135.0)		17.0 (135.0)
	1994	'94 Catchables	2,350	263.0			35.0 (43.0)		35.0 (43.0)
Treasureton Reservoir	1992	'92 Catchables	15,960	2,381.0	36.5 (67.0)				36.5 (67.0)
	1993	'93 Catchables	16,002	1,746.0		79.0 (322.0)			79.0 (322.0)
Chesterfield Reservoir	1992-94	'92 Catchables	20,000	1,588.0	7.2 (10.0)				7.2 (10.0)
	1992-94	'92 Fall fingerlings	134,995	6,226.0		1.0 (--)			1.0 (--)
	1993-94	'93 Catchables	39,995	4,491.0		19.0 (96.0)	15.2 (105.0)		34.2 (201.0)
	1993-94	'93 Fall fingerlings	129,850	5,557.0			34.0 (330.0)		34.0 (330.0)
	1994	'94 Catchables	40,000	4,480.0			41.4 (92.4)		41 .4 (92.4)
Ririe Reservoir	1993	'92 Fall fingerlings	162,530	4,159.0		2.8 (23.5)			2.8 (23.5)
	1993	'93 Catchables	12,019	3,848.0		54.4 (68.7)			54.4 (68.7)

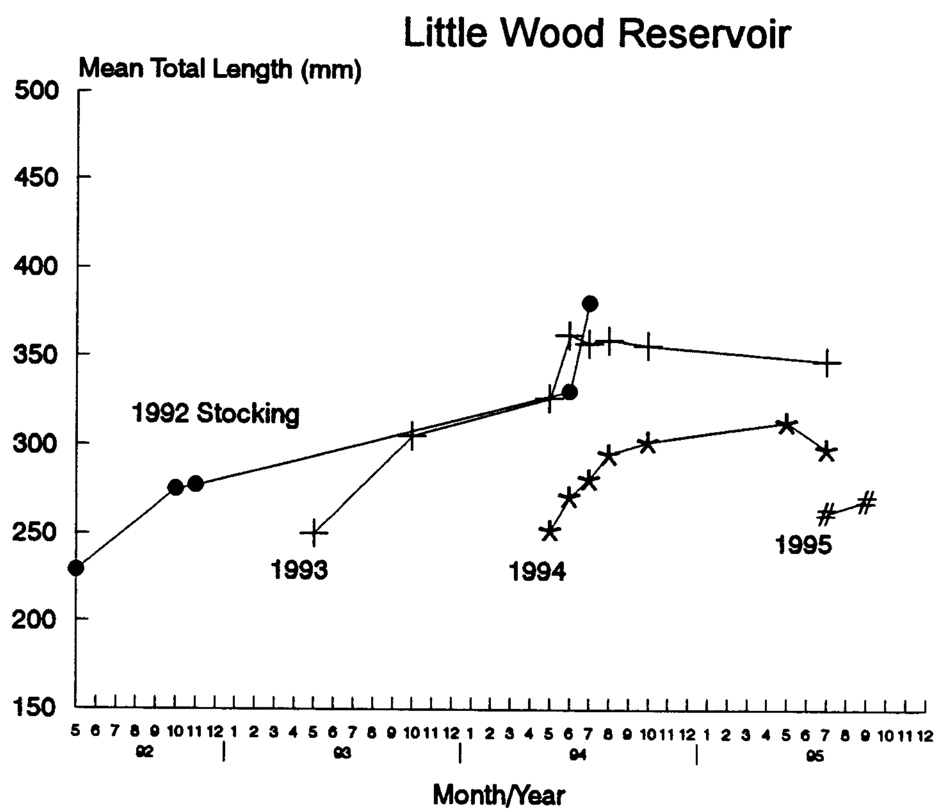
Appendix C. Estimated cost per fish and per kilogram to the creel for hatchery trout in 18 Idaho lakes and reservoirs.

Water	Census year	Stocked group	Cost/fish creeled ($)	Cost/kilogram creeled ($)
Spirit Lake	1992	'92 Catchables	8.42	
Hauser Lake	1993	'90-92 Fall fingerlings	2.06	3.99
	1993	'93 Catchables	0.70	
Spring Valley Reservoir	1993	'92 Fall fingerlings	21.05	164.38
	1993	'93 Catchables	1.00	4.30
	1993	'93 Spring fingerlings	1.73	12.20
Mann Lake	1993	'93 Catchables	0.95	4.58
	1993	'93 Spring fingerlings	13.63	90.00
Winchester Lake	1993	'92 Fall fingerlings	3.37	27.91
	1993	'93 Catchables	0.89	3.85
Soldiers Meadow Reservoir	1993	'93 Catchables	0.69	3.51
	1993	'93 Spring fingerlings	0.54	6.41
Cascade Reservoir	1991-92	'90 Spring fingerlings	12.77	35.43
	1991-92	'90 Fall fingerlings	25.00	53.44
	1991-92	'90 Fall fingerlings	17.39	40.70
	1991-92	'91 Catchables	2.37	7.49
	1991-92	'91 Fall fingerlings	1028.00	
	1992	'92 Catchables	4.58	15.17
C.J. Strike Reservoir	1992	'91 Fall fingerlings	9.23	
	1992	'92 Catchables	1.97	
Magic Reservoir	1992-95	'92 Catchables	1.90	7.95
	1992-95	'92 Spring fingerlings	1.28	4.08
	1992-95	'92 Fall fingerlings	124.27	
	1993-95	'93 Catchables	1.62	3.83
	1993-95	'93 Spring fingerlings	4.48	10.79
	1993-95	'93 Fall fingerlings	2.20	9.43
	1994-95	'94 Catchables	4.13	18.22
	1994-95	'94 Fall fingerlings	100.34	445.96
	1995	'95 Catchables	2.12	3.86

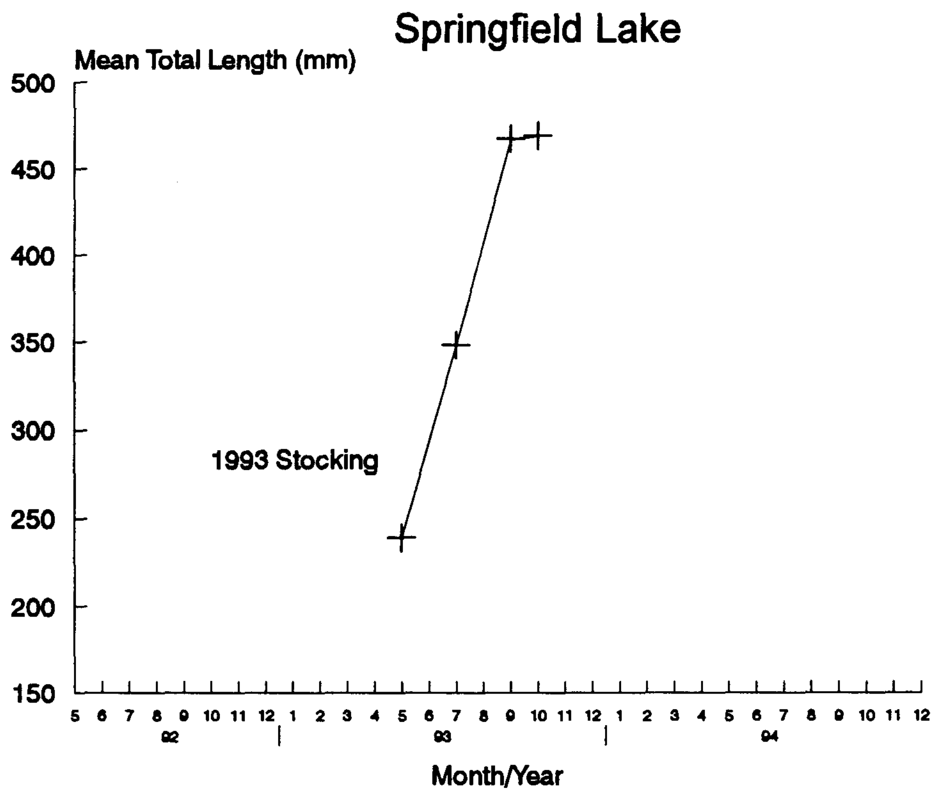
Appendix C. Continued.

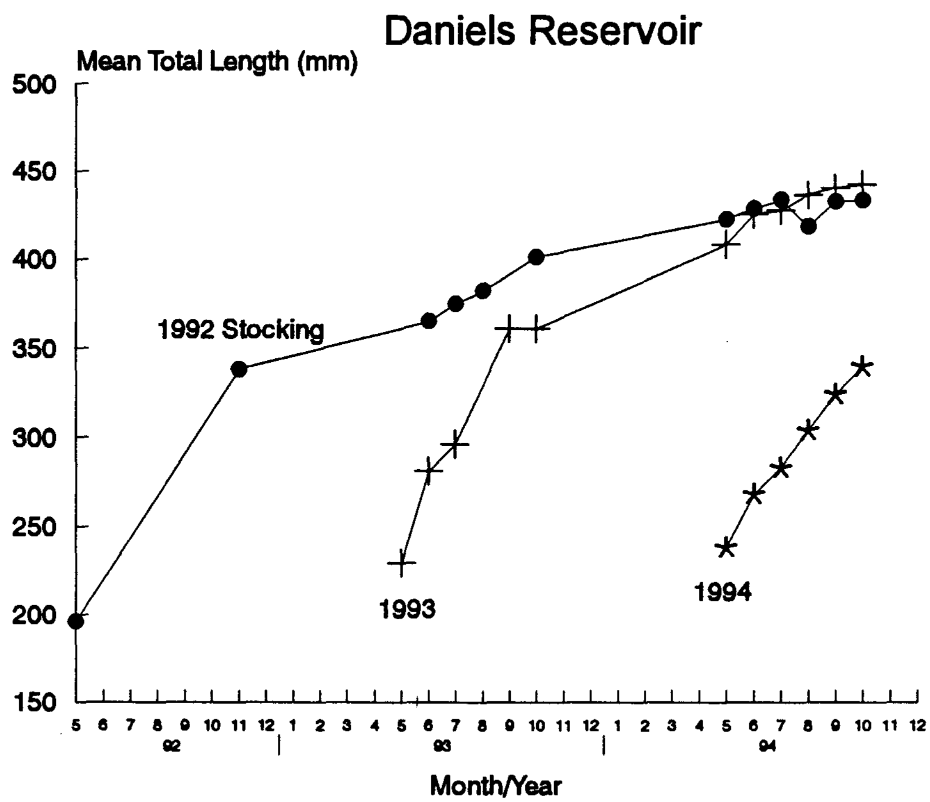
Water	Census year	Stocked group	Cost/fish creeled ($)	Cost/kilogram creeled ($)
Little Wood Reservoir	1992-95	'92 Catchables	1.41	6.93
	1992-95	'92 Spring fingerlings	0.57	2.07
	1992-95	'92 Fall fingerlings	38.30	
	1993-95	'93 Catchables	0.61	2.32
	1993-95	'93 Spring fingerlings	0.17	0.51
	1993-95	'93 Fall fingerlings	0.55	2.86
	1994-95	'94 Catchables	0.73	2.79
	1994-95	'94 Spring fingerlings	0.29	1.68
	1994-95	'94 Fall fingerlings	8.51	81.08
	1995	'95 Catchables	3.35	15.24
Springfield Lake	1992-94	'92 Catchables	4.01	9.28
	1992-94	'92 Fall fingerlings	0.79	5.68
	1993-94	'93 Catchables	540.00	427.37
	1993-94	'93 Fall fingerlings	2.55	16.96
Twin Lakes	1992-94	'92 Catchables	1.46	4.67
	1992-94	'92 Fall fingerlings	1.03	2.75
	1993-94	'93 Catchables	2.58	8.62
	1993-94	'93 Fall fingerlings	0.47	1.51
	1994	'94 Catchables	2.05	10.97
Winder Reservoir	1992-94	'92 Catchables	0.89	3.83
	1992-94	'92 Fall fingerlings	20.00	86.47
	1993-94	'93 Catchables	1.87	7.25
	1993-94	'93 Fall fingerlings	0.71	2.94
	1994	'94 Catchables	1.54	11.22
Treasureton Reservoir	1992	'92 Catchables	1.48	5.40
	1993	'93 Catchables	0.68	1.54
Chesterfield Reservoir	1992-94	'92 Catchables	7.50	68.00
	1992-94	'92 Fall fingerlings	6.67	
	1993-94	'93 Catchables	1.58	2.39
	1993-94	'93 Fall fingerlings	0.35	0.85
	1994	'94 Catchables	1.30	1.54
Ririe Reservoir	1993	'92 Fall fingerlings	4.28	19.98
	1993	'93 Catchables	0.99	2.46





Appendix D-1. Growth of catchable rainbow trout in nine Idaho reservoirs, 1992-1995.





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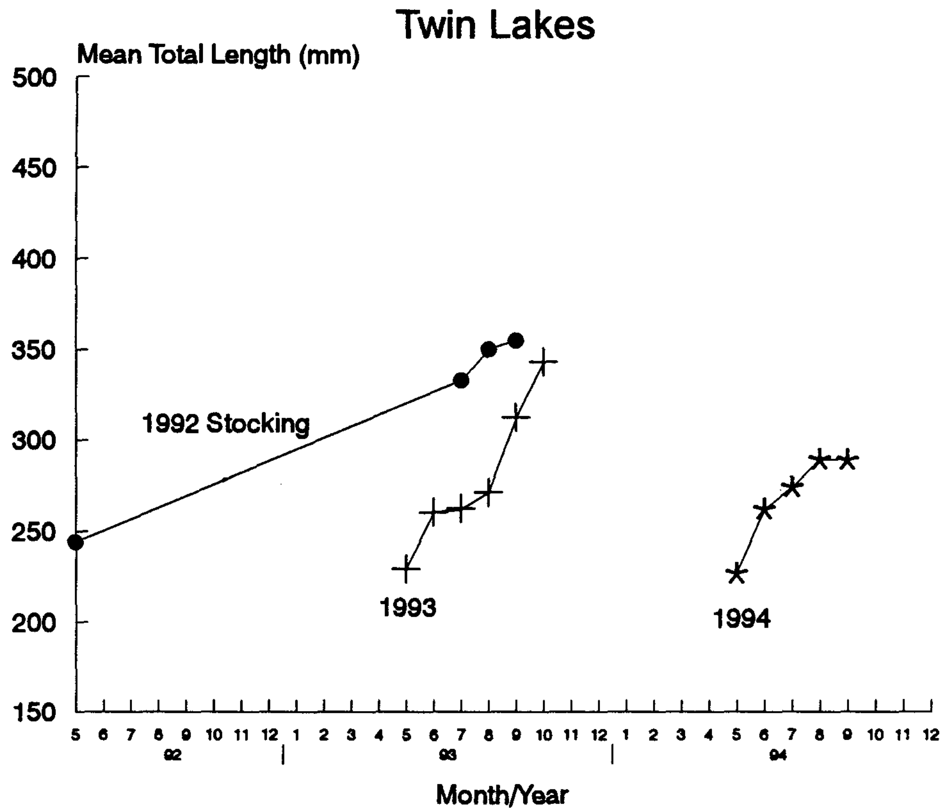

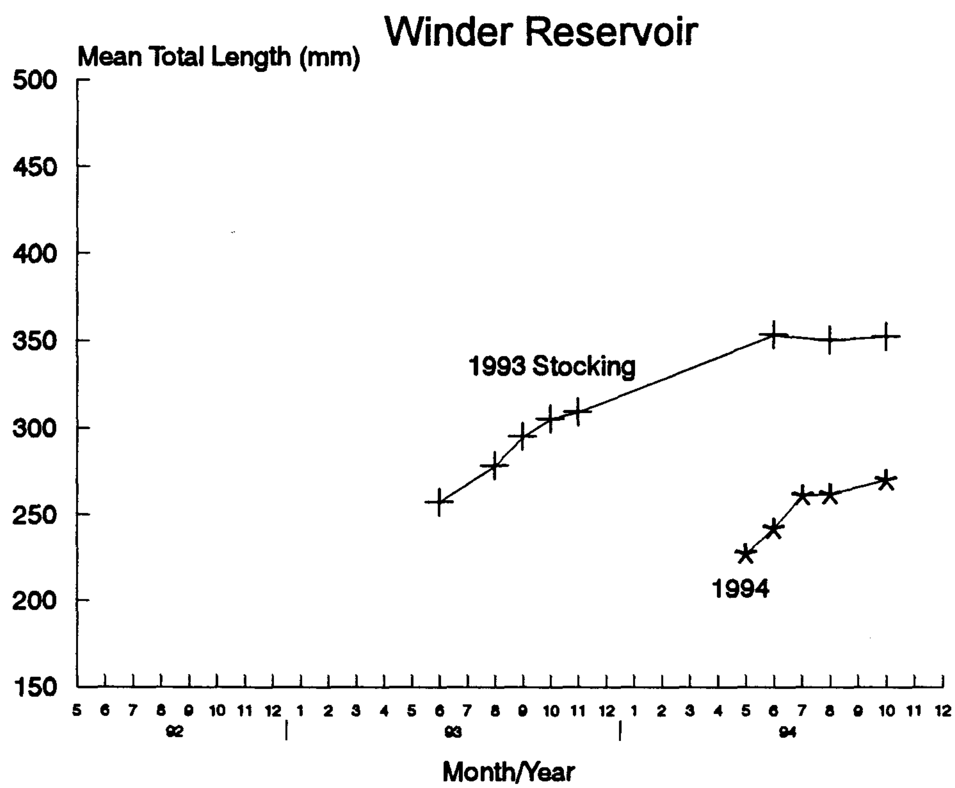

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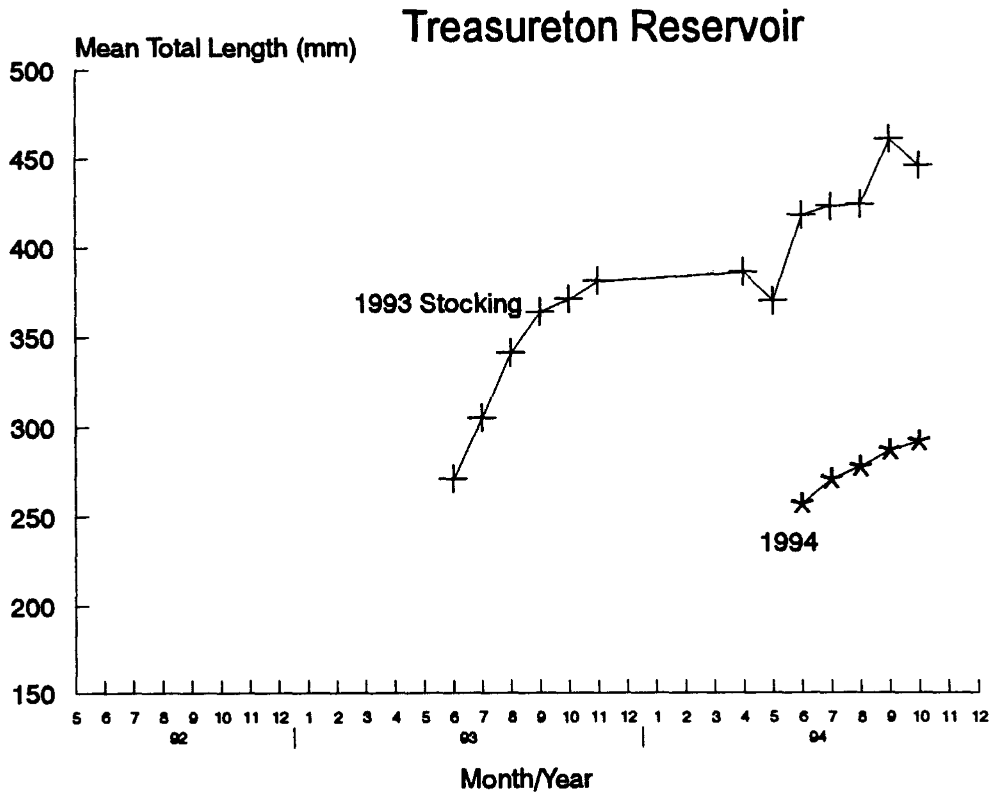

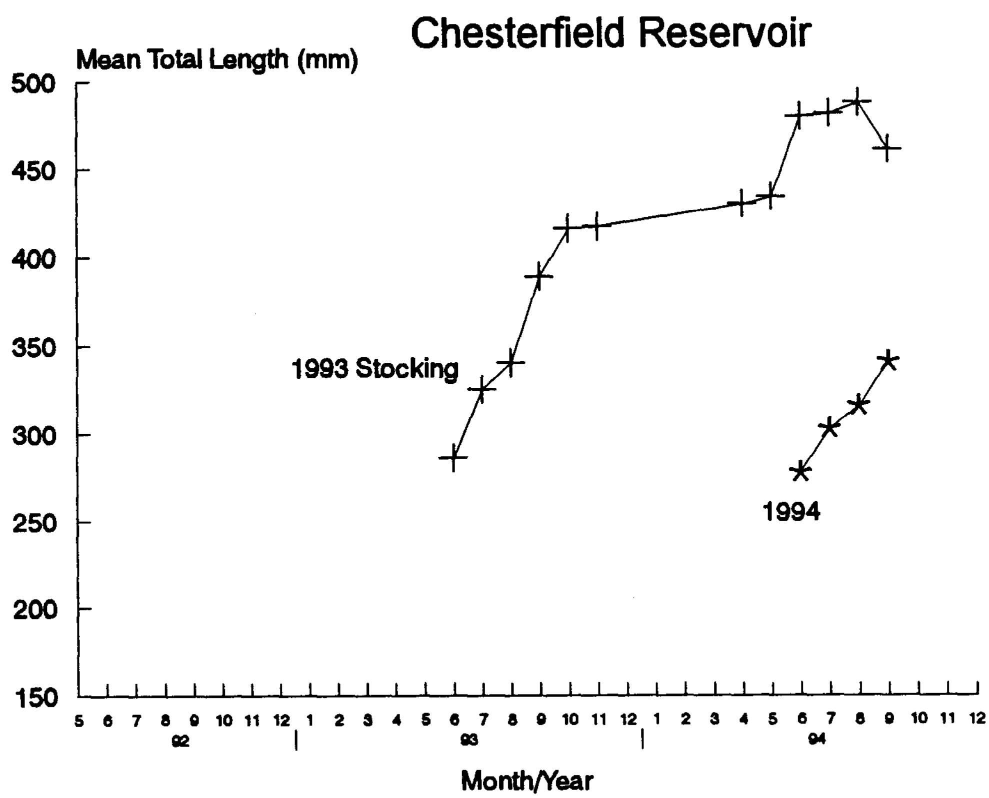

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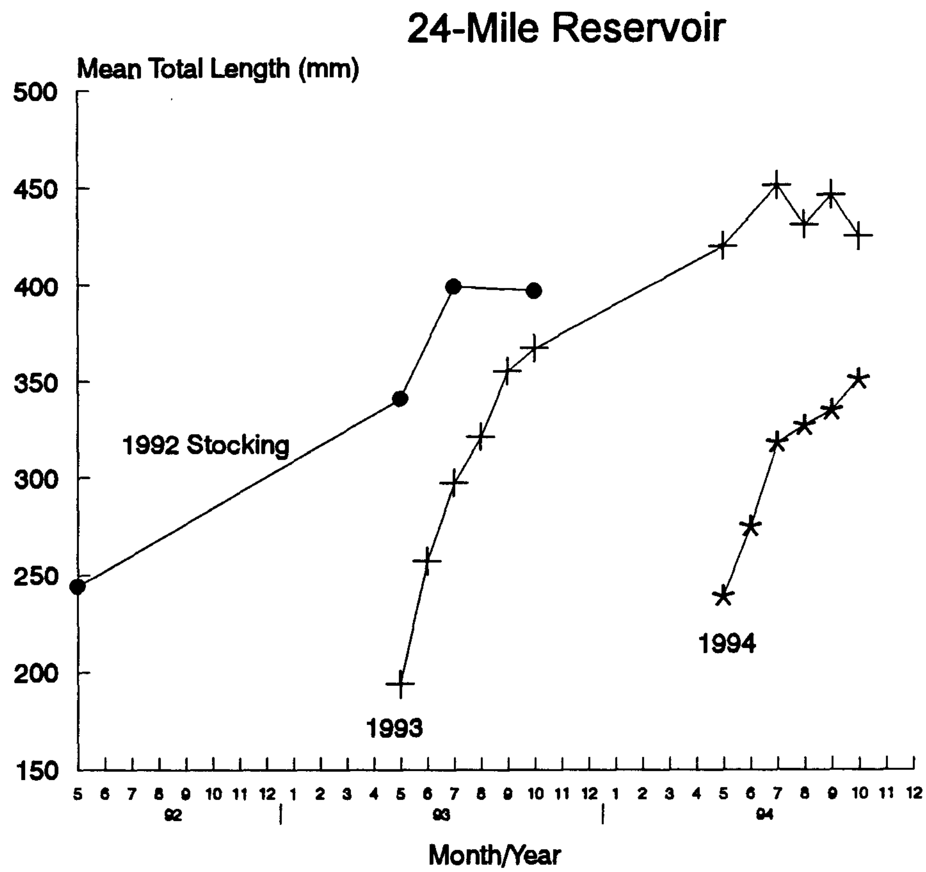

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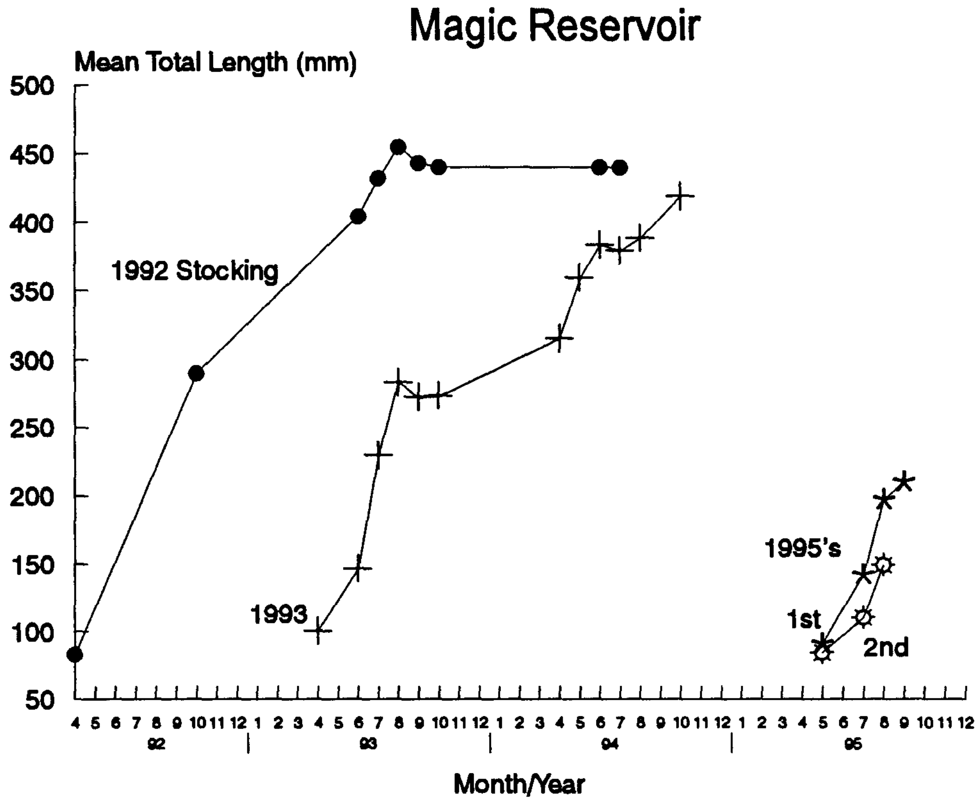
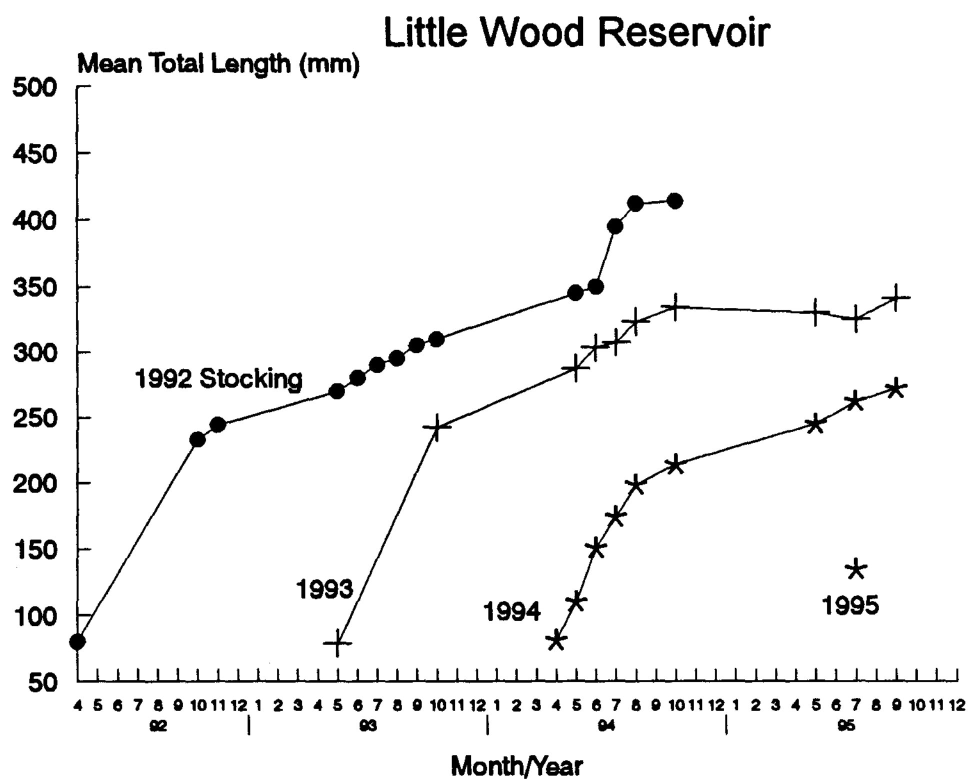
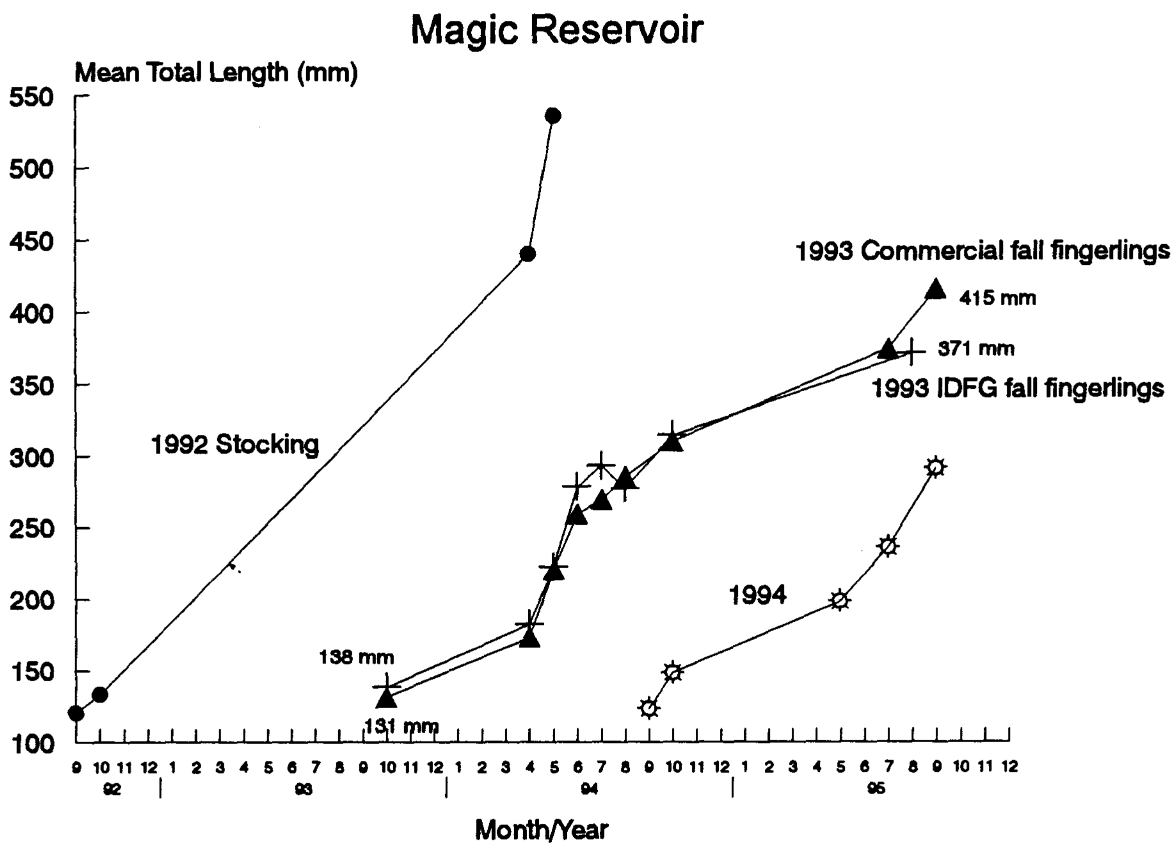
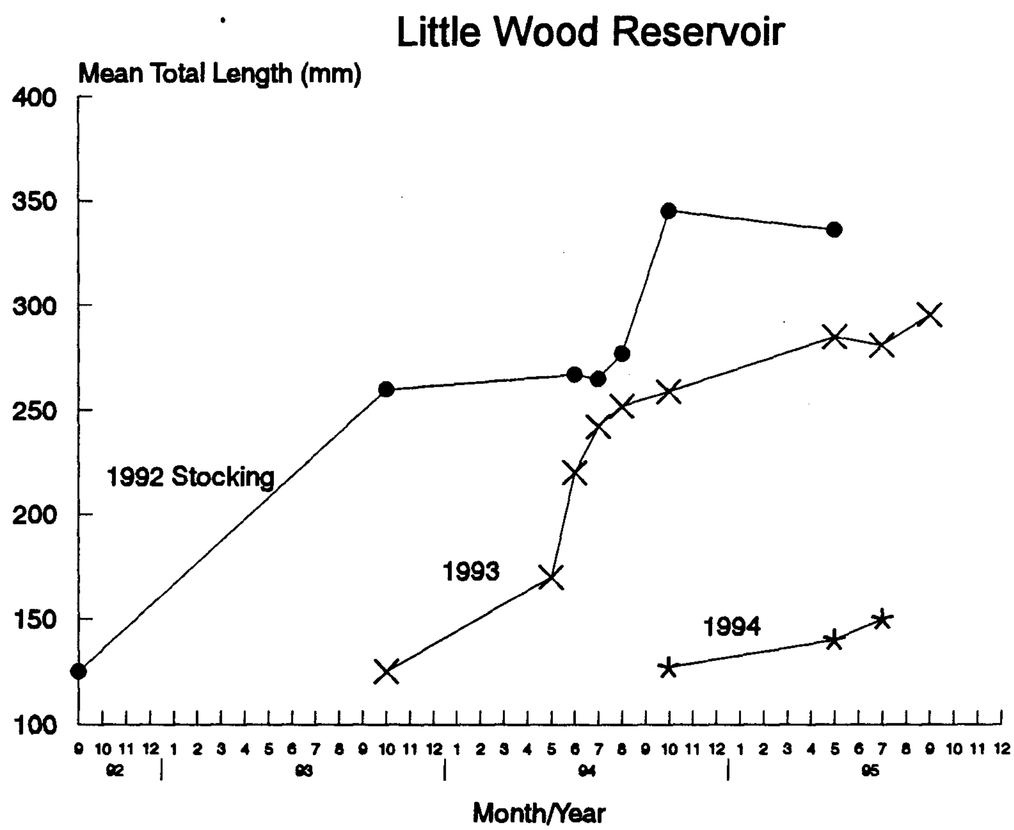


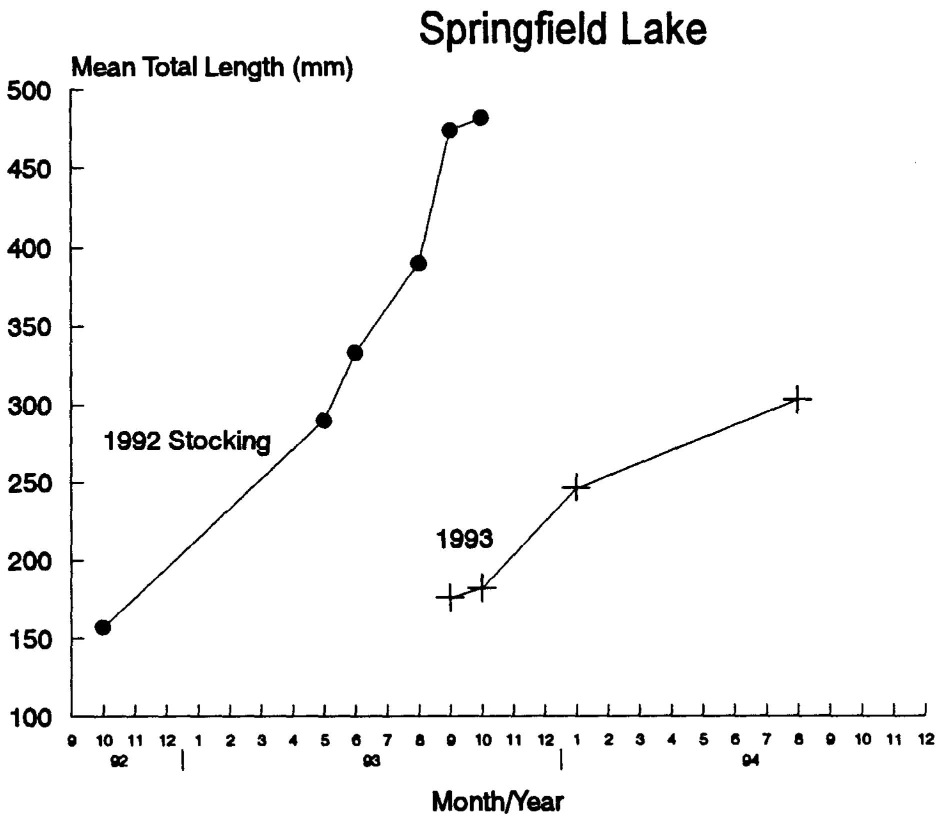


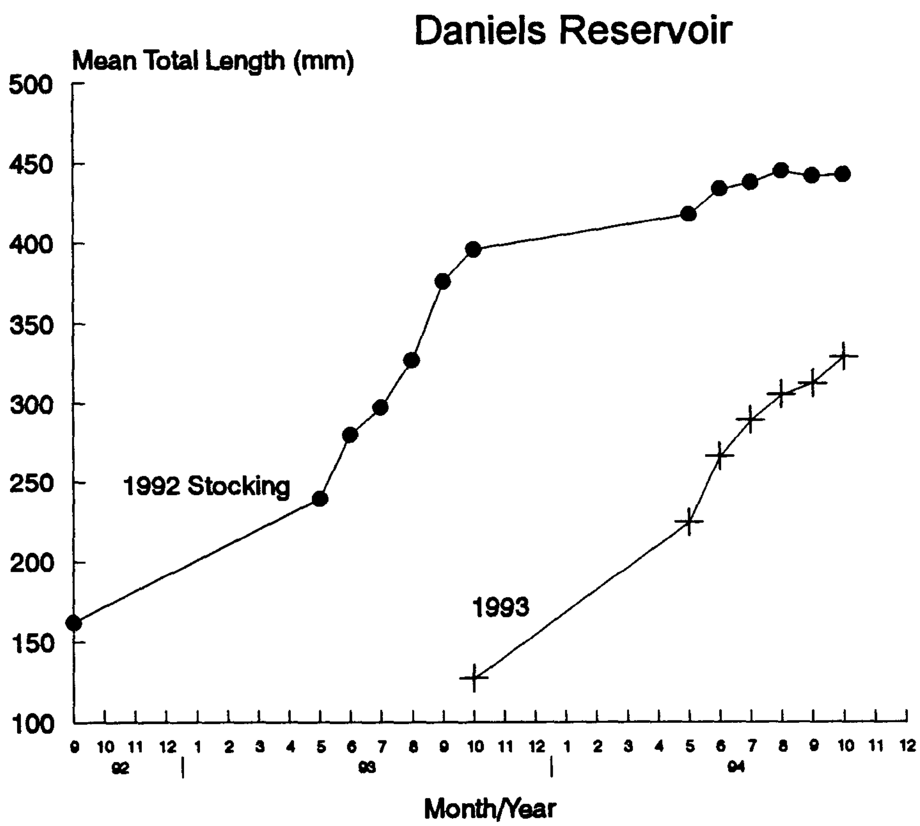
Appendix D-2. Growth of spring fingerling rainbow trout in Magic and Little Wood reservoirs, 1992-1995.





Appendix D-3. Growth of fingerling rainbow trout in nine Idaho reservoirs, 1992-1995.





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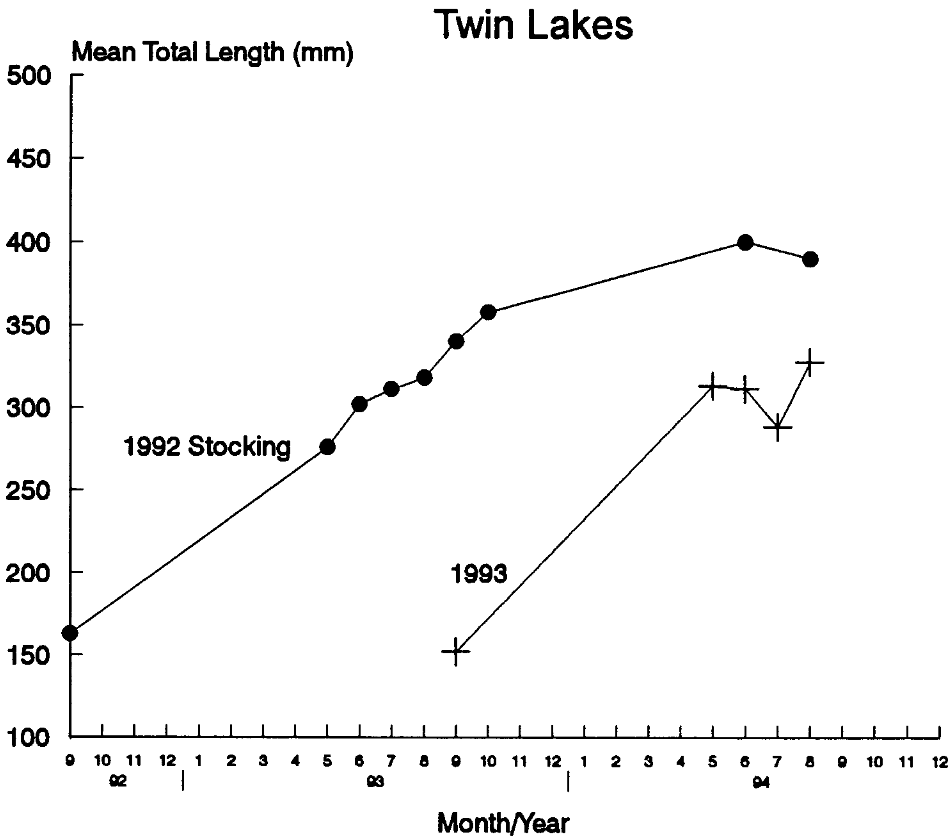

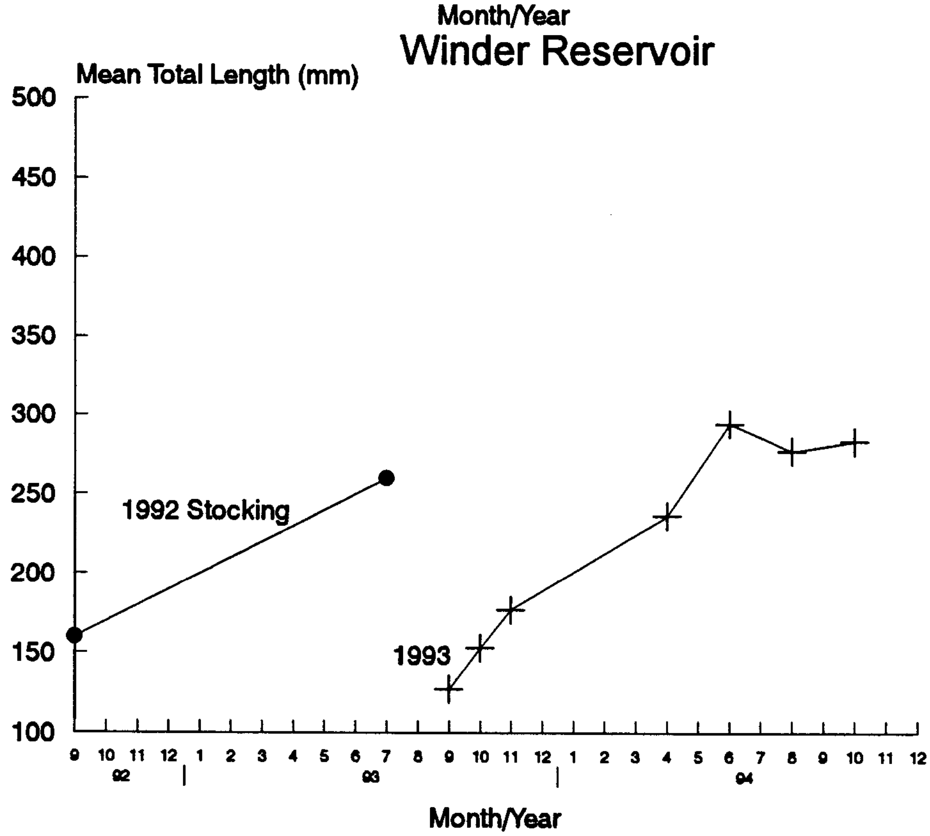

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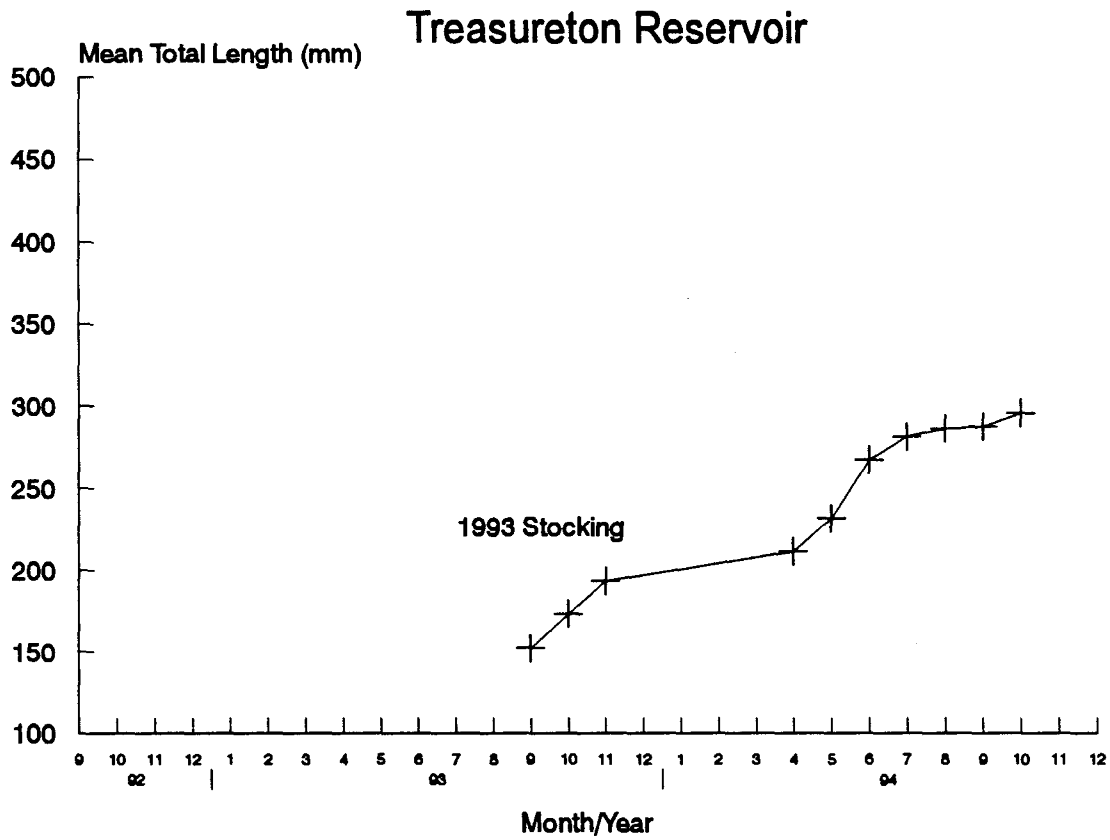

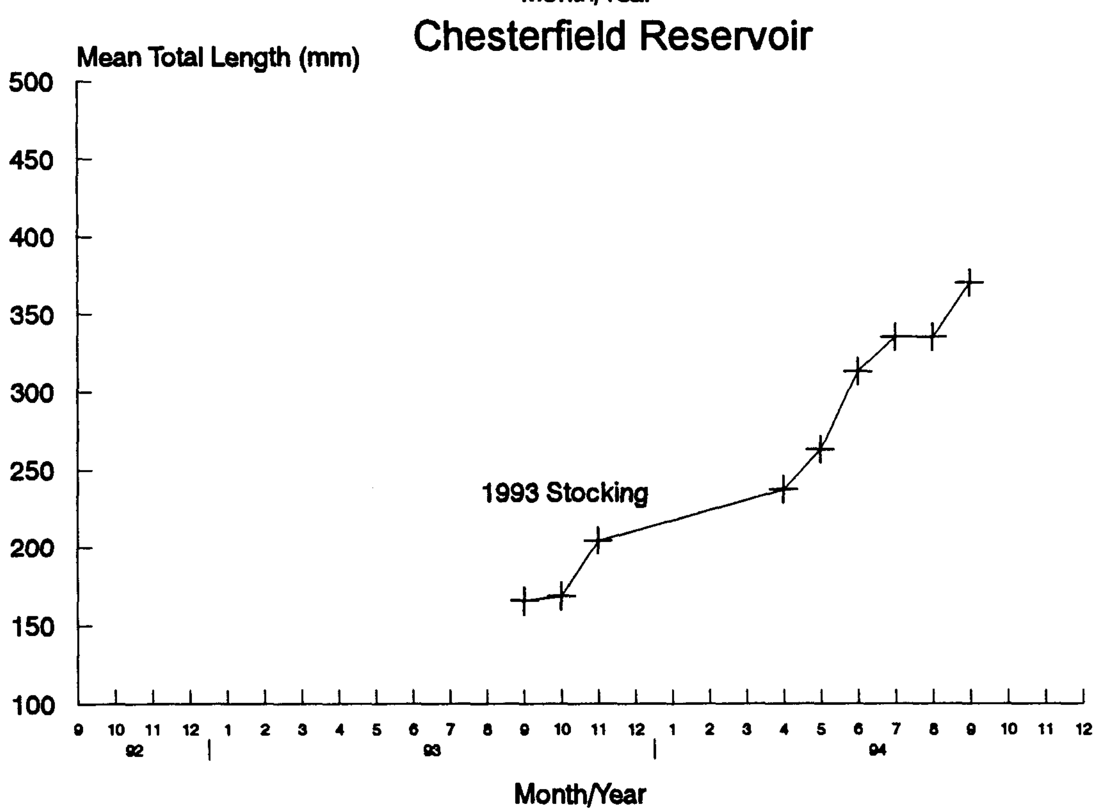

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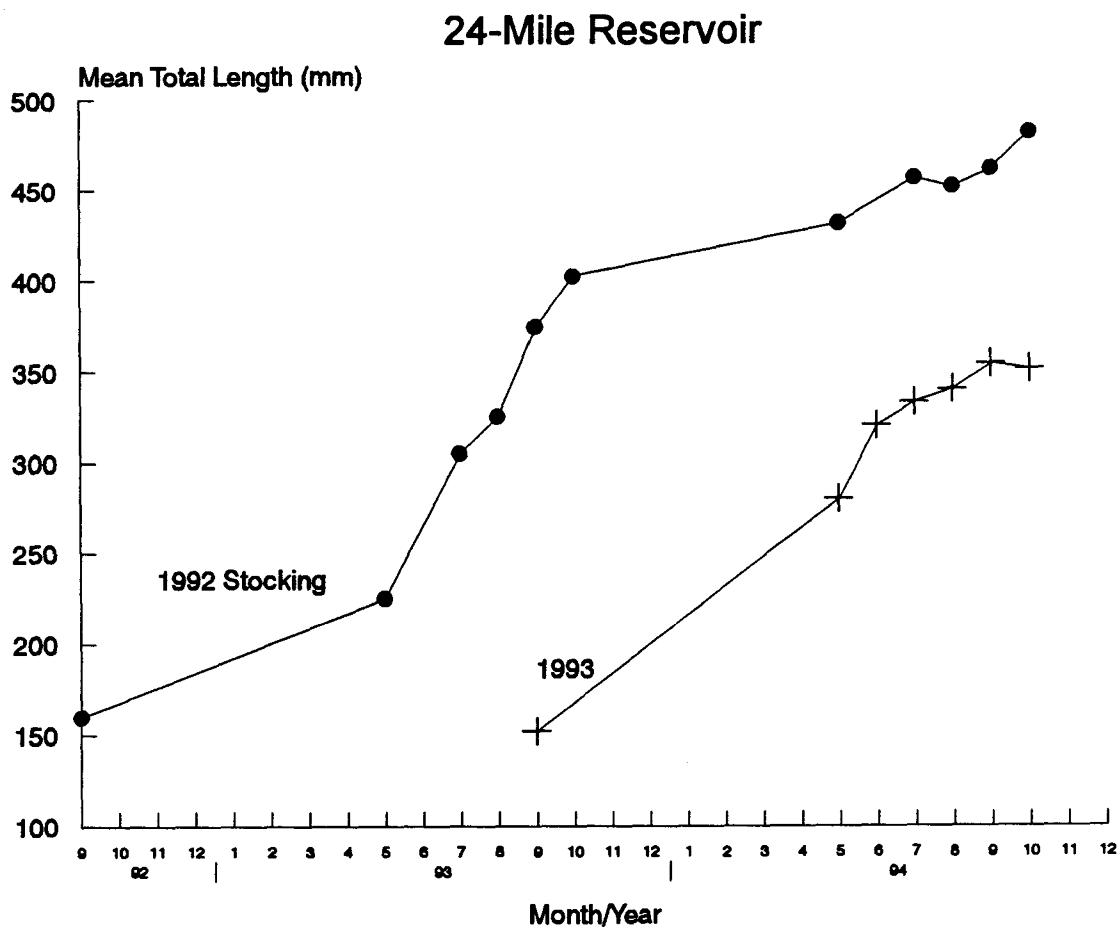


Appendix D-3. Continued.

Appendix E. Mean monthly relative weight (all size classes combined) for rainbow trout in eight Idaho reservoirs, 1994-1995.

Location	Mean Relative Weiaht 1994 11995)					
	May	June	July	August	September	October
Magic Reservoir	103 (101)	106 (--)	93 (102)	94 (106)	-- (95)	83 (--)
Little Wood Reservoir	94 (82)	92 (--)	93 (80)	83 (--)	-- (89)	81 (--)
Daniels Reservoir	112 (93)	101 (--)	98 (88)	100 (--)	92 (93)	94 (--)
Twin Lakes	103 (106)	96 (--)	96 (103)	90 (--)	87 (123)	-- (--)
Winder Reservoir	-- (--)	87 (--)	87 (--)	-- 1--)	88 (--)	67 (--)
Treasureton Reservoir	116 (107)	103 (--)	97 (94)	92 (--)	86 (96)	98 (--)
Chesterfield Reservoir	115 (--)	111 (--)	106 (101)	101 (--)	100 (111)	-- (--)
24-Mile Reservoir	117 (110)	107 (--)	104 (99)	99 (98)	93 (102)	102 (--)

Appendix F. Limnological data and fish species composition for Idaho lakes and reservoirs with fingerling-catchable stocking evaluations.

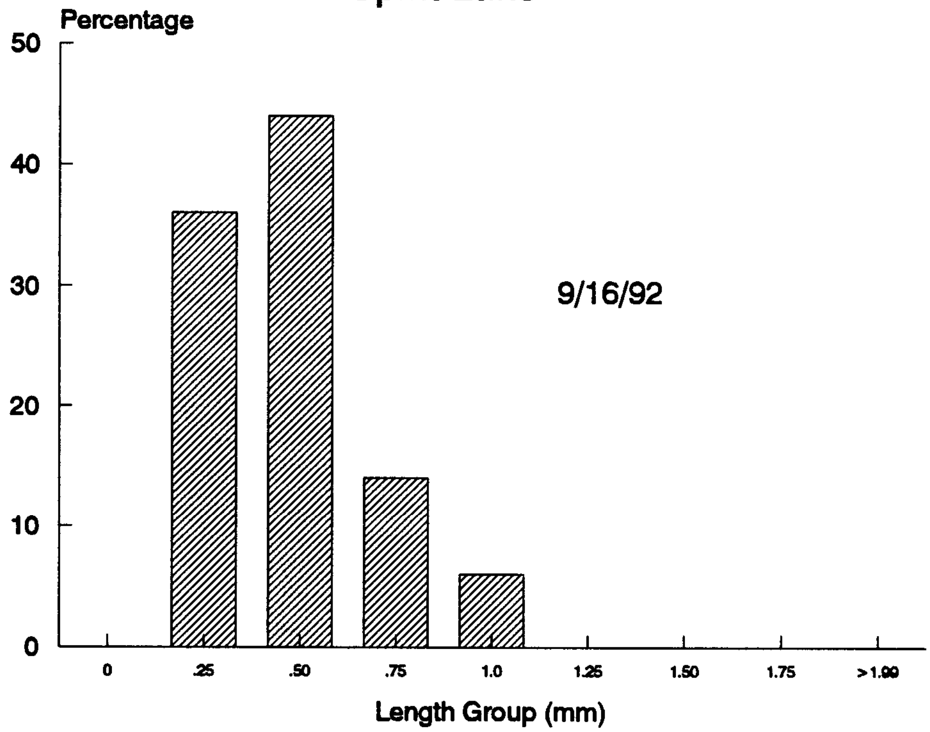
Location	Surface Area At Full Pool (hectares)	Mean Depth (m)	Conductivity (mmhos/cm)	Secchi Disk Transparency (m)	Total Phosphorous (mg/l)	Alkalinity (mg/l)	Total Dissolved Solids (mg/l)	Species Composition'
Spirit Lake	1,700		50	12.7	0.042	25.0	33.0	KOK, LMB, PMS, NOP, CT, BCR, PWF
Hauser Lake	245	6.0	45	5.2	0.015	19.2	30.0	PMS, YEP, BCR, TEN, LMB, TIM
Spring Valley Reservoir	21	4.3	31	2.7	--	--	22.8	LMB, BLG
Mann Lake	49	4.7	84	1.8	--	--	58.2	LMB, PMS, BCR, SU
Winchester Reservoir	34	3.4	135	1.0	0.062	67.6	90.2	LMB, BBH
Soldiers Meadow Reservoir	41		63	0.8	0.080	27.4	42.0	KOK, BCR
Cascade Reservoir	12,145	17.1	58	2.9	0.050	17.3	38.7	YEP, COH, SMB, SU, KOK, BBH, MWF
C.J. Strike Reservoir	3,036	2.1	651	1.3	0.042	152.0	434.0	BLG, LMB, SMB, YEP, BCR, SQF, RSS, SU, CAR, CHS, BBH, CCF
Magic Reservoir	729	32.5	492	2.7	0.022	97.9	328.0	WRB, YEP, SU, RSS
Little Wood Reservoir	238	16.1	295	2.4	--	--	196.7	WRB, SU
Springfield Lake	26	1.6	529	2.7	--	--	352.7	UTC, SU, BRT
Daniels Reservoir	151	7.0	507	2.6	--	--	338.0	LCT, HYB
Twin Lakes	181	9.5	304	3.5	--	--	159.8	CAR, BLG, LMB, TIM

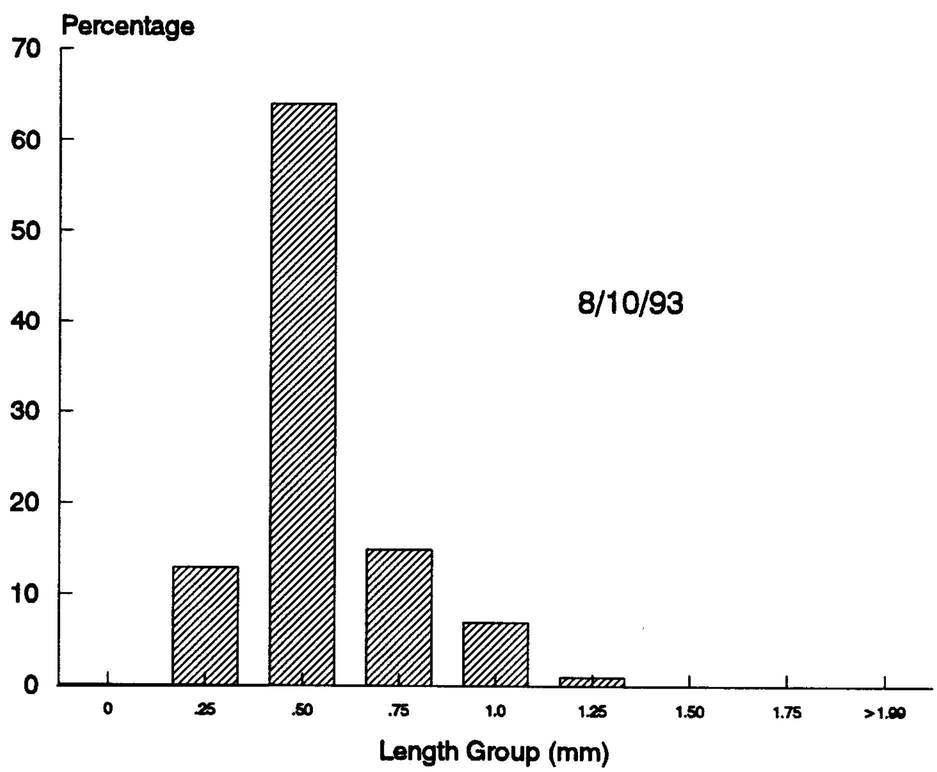
Appendix F. Continued.

Location	Surface Area At Full Pool (hectares)	Mean Depth (m)	Conductivity (mmhos/cm)	Secchi Disk Transparency (m)	Total Phosphorous (mg/l)	Alkalinity (mg/l)	Total Dissolved Solids (mg/l)	Species Composition°
Winder Reservoir	38	5.4	218	4.1	--	--	145.3	LMB, BLG, YEP, GSF
Treasureton Reservoir	63				0.198	165.0		Hatchery rainbow only
Chesterfield Reservoir	645	4.5	290	1.5	0.045	152.0	193.3	BRT
24-Mile Reservoir	20	3.0	600	6.7	--	--	400.0	MTS, LCT, HYB, BKT
Ririe Reservoir	632	19.6	310	7.0	0.015	169.0	207.0	SMB, UTC, SU, RSS, KOK, YEP

KOK = kokanee; LMB = largemouth bass; PMS = pumpkinseed sunfish; YEP = yellow perch; NOP = northern pike; CT = cutthroat trout; BCR = black crappie; PWF = pygmy whitefish; BBH = brown bullhead; TEN = tench; TIM = tiger musky; BLG = bluegill; SU = sucker species; COH = coho salmon; SMB = smallmouth bass; SQF = northern squawfish; MWF = mountain whitefish; RSS = redside shiner; CAR = carp; CHS = chiselmouth; CCF = channel catfish; WRB = wild rainbow trout; UTC = Utah chub; BRT = brown trout; LCT = Lahontan cutthroat trout; HYB = rainbow x cutthroat hybrids; GSF = green sunfish; MTS = mountain sucker; BKT = brook trout.

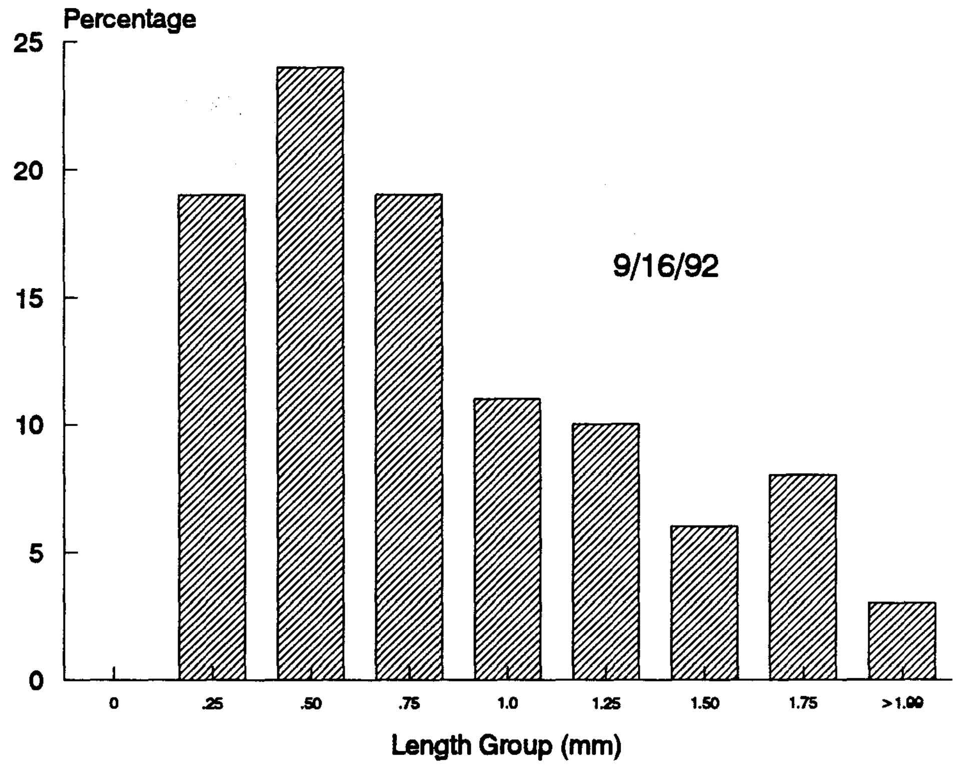
Spirit Lake

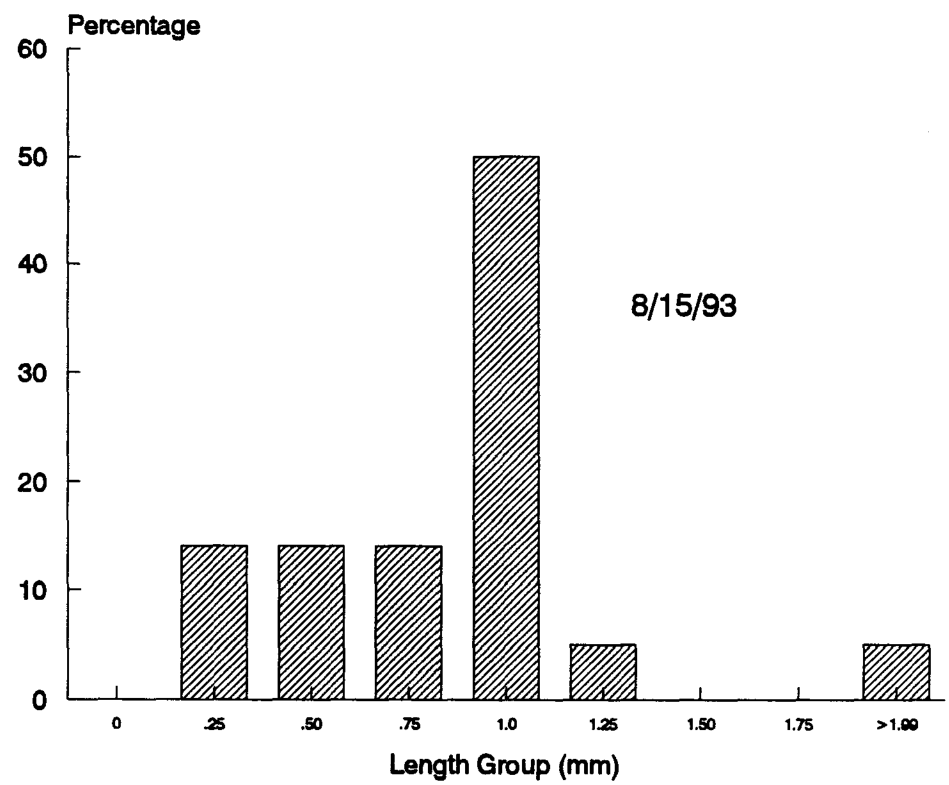




Appendix G. Graphical representations of interannual variations in zooplankton length frequencies (all general combined) in Idaho lakes and reservoirs with fingerling-catchable stocking evaluations.

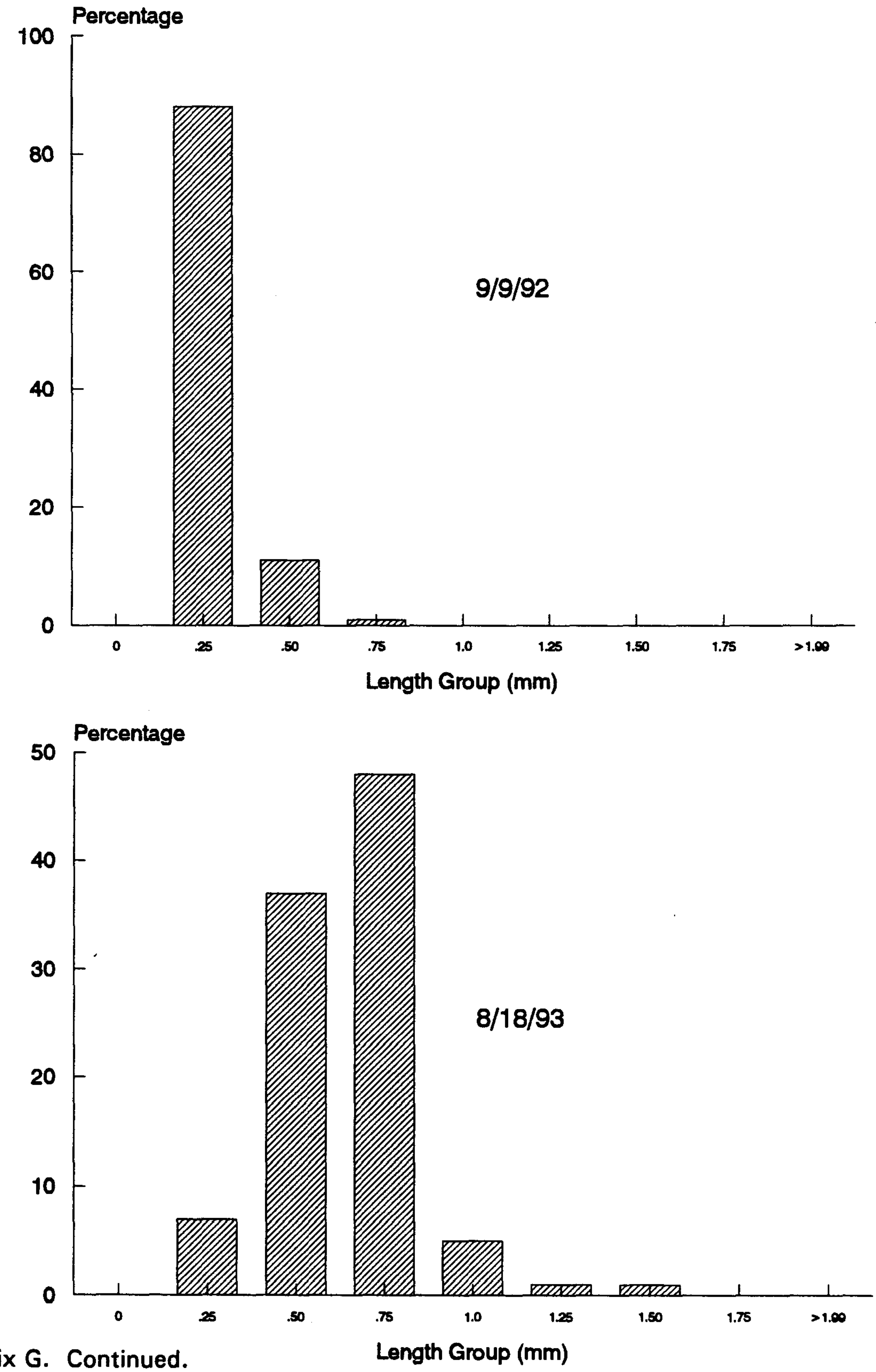
Hauser Lake





Appendix G. Continued.

Mann Lake



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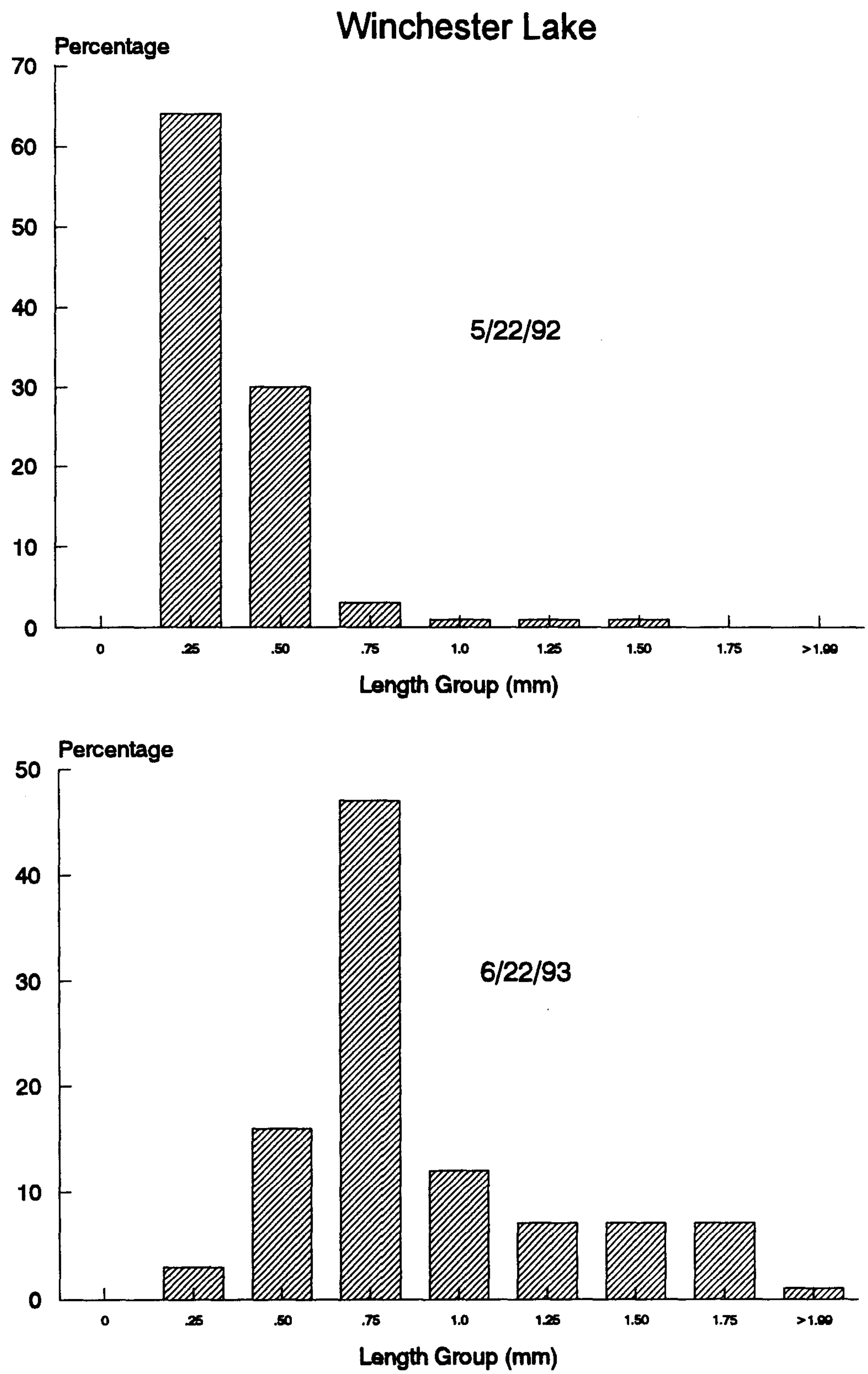
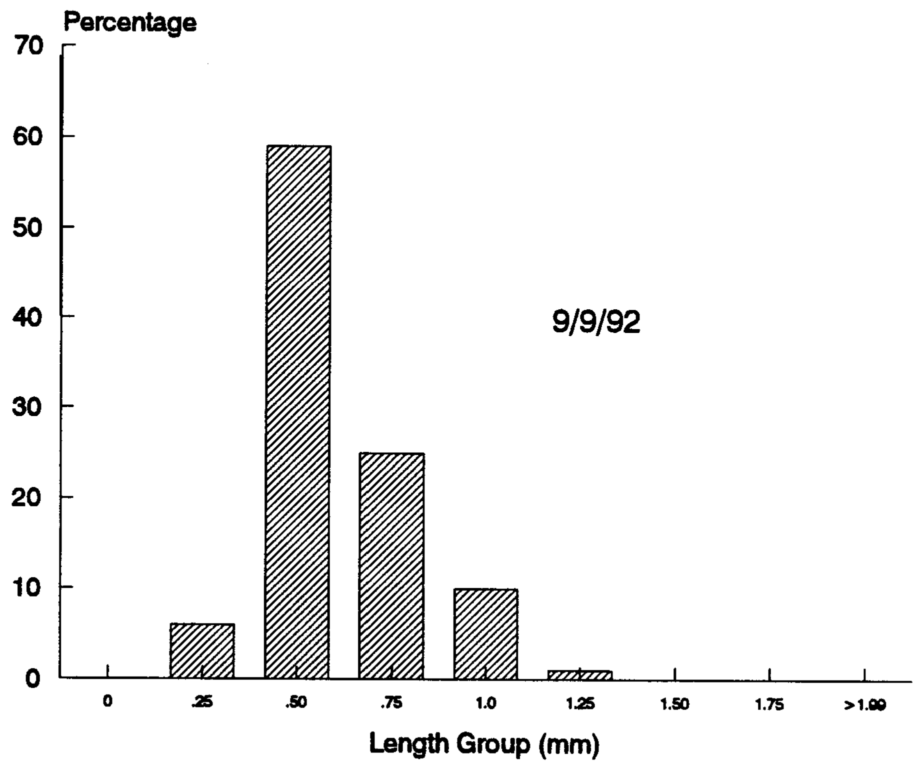
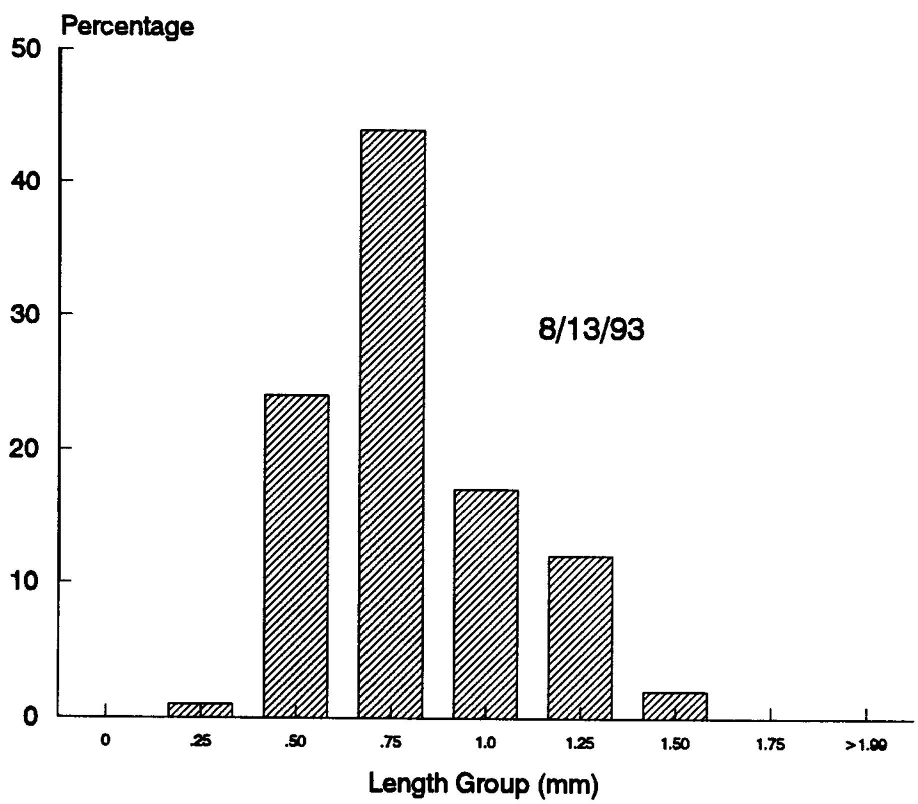


Appendix G. Continued.

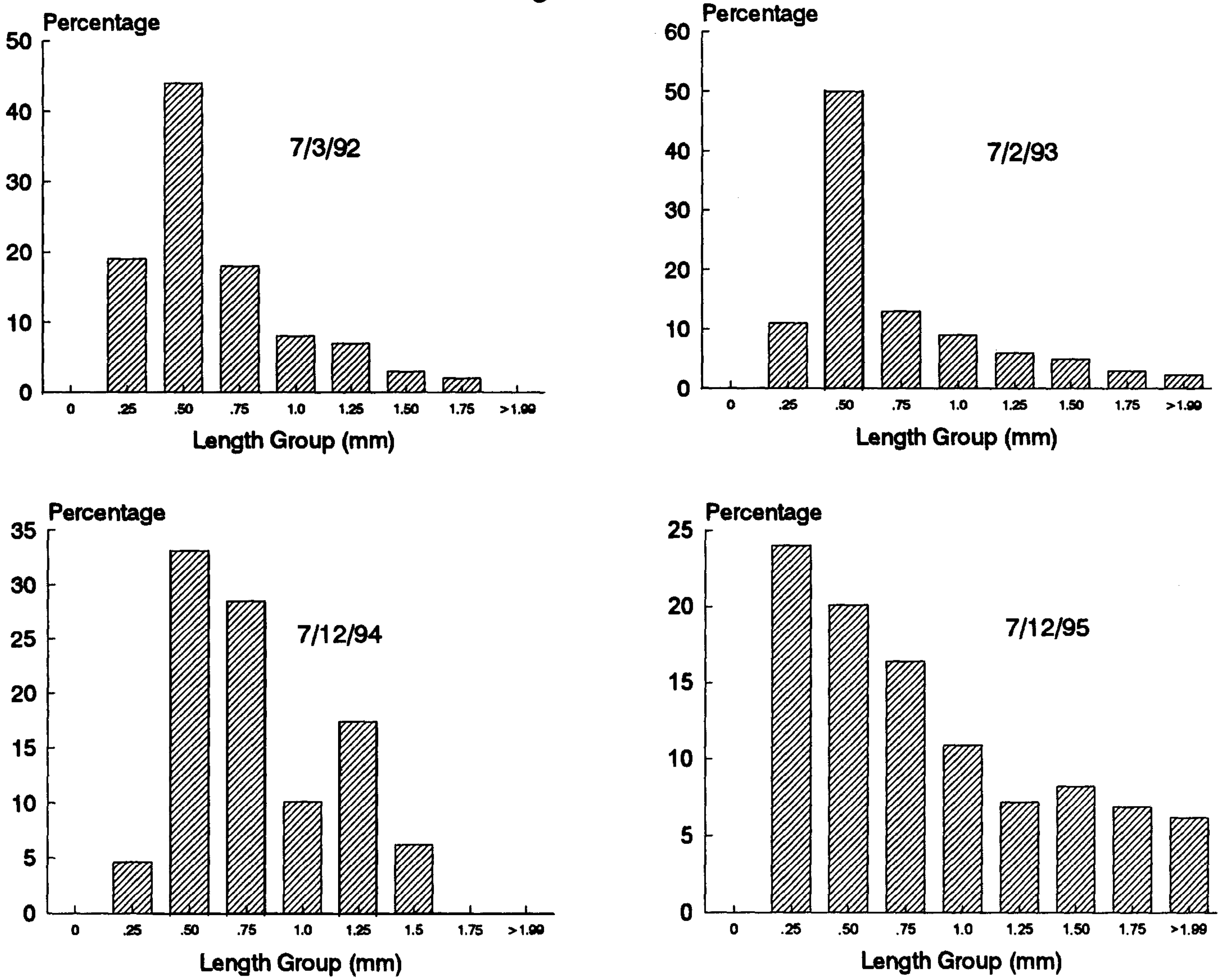
Soldiers Meadows Reservoir





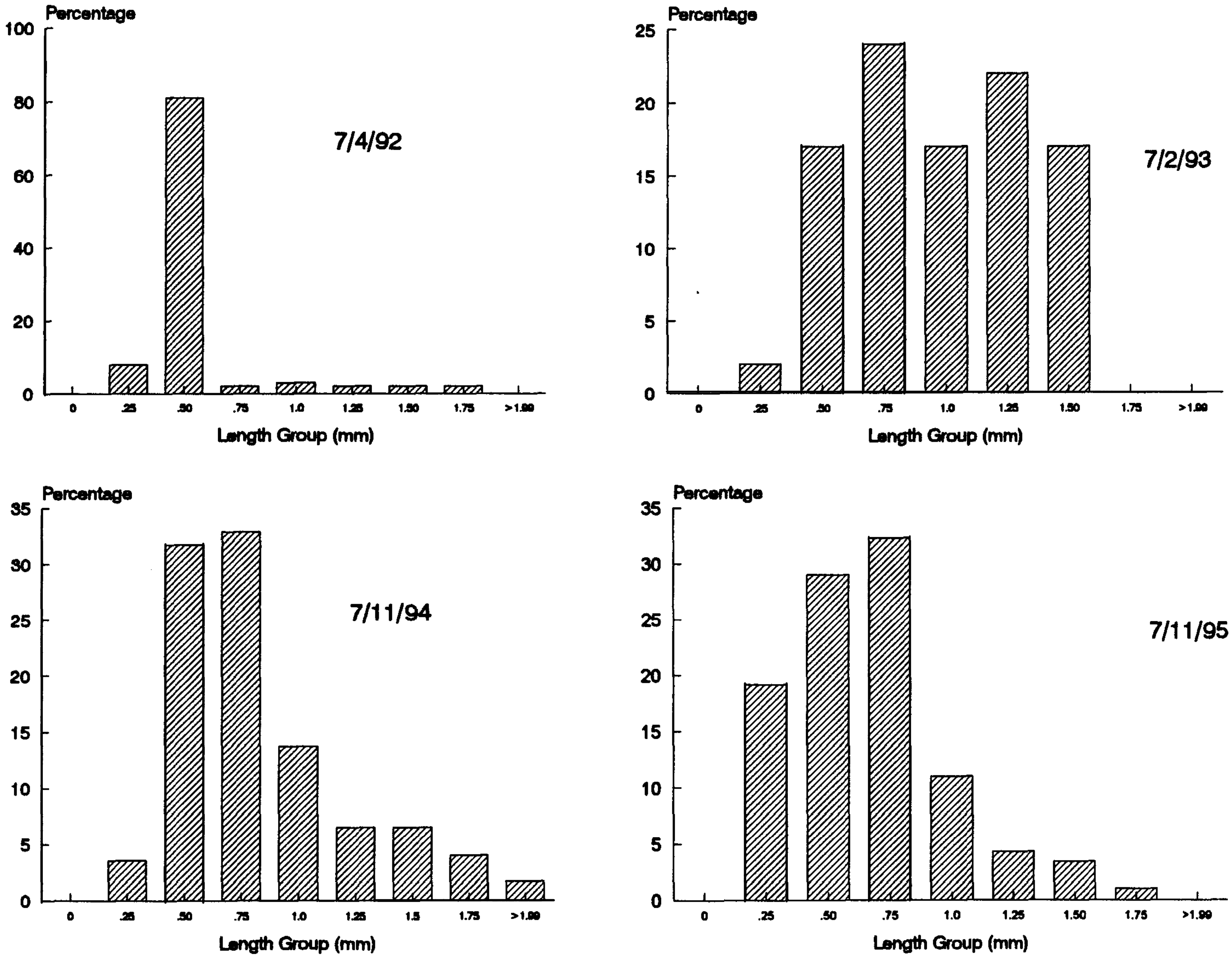
Appendix G. Continued.

Magic Reservoir



Appendix G. Continued.

Little Wood Reservoir



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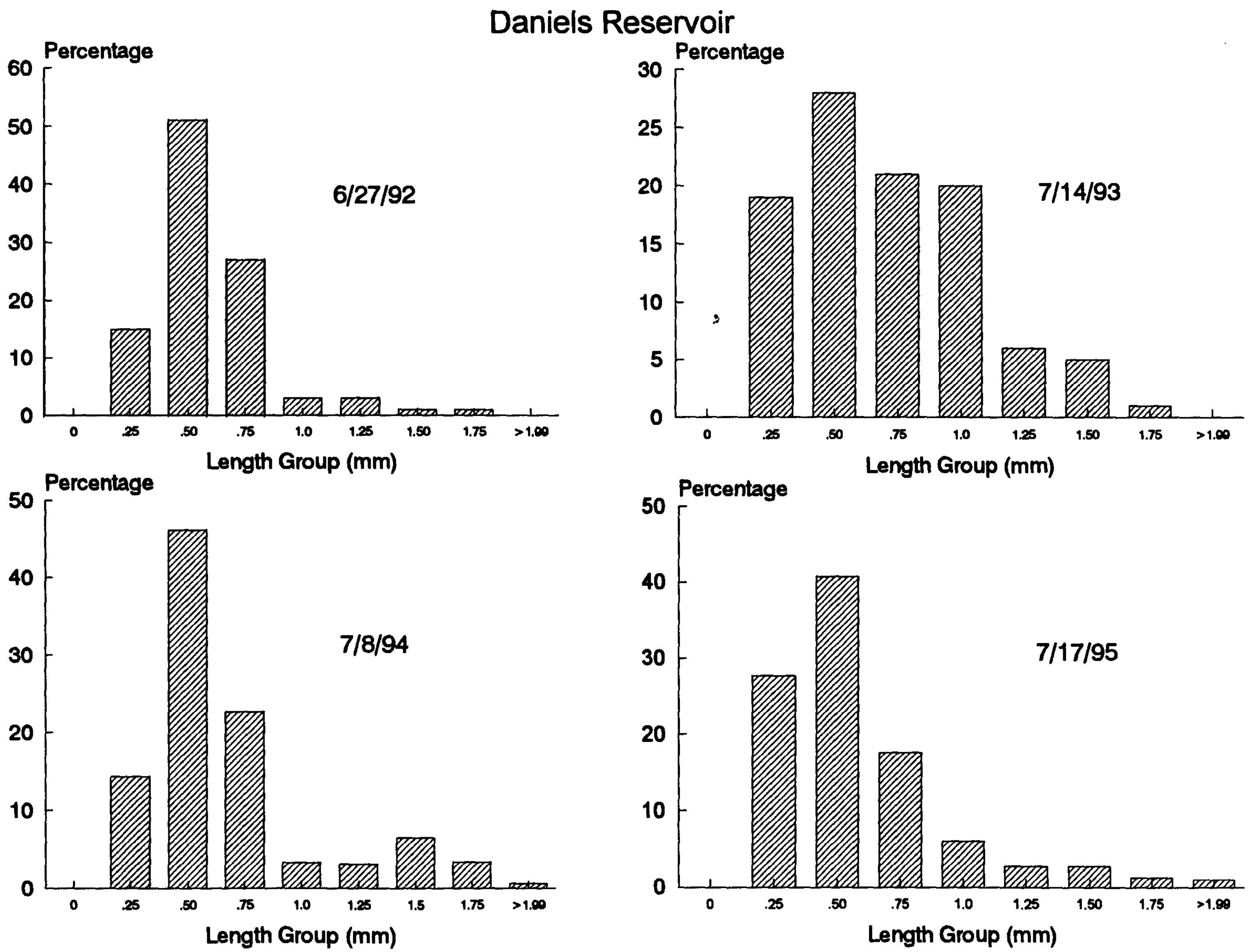

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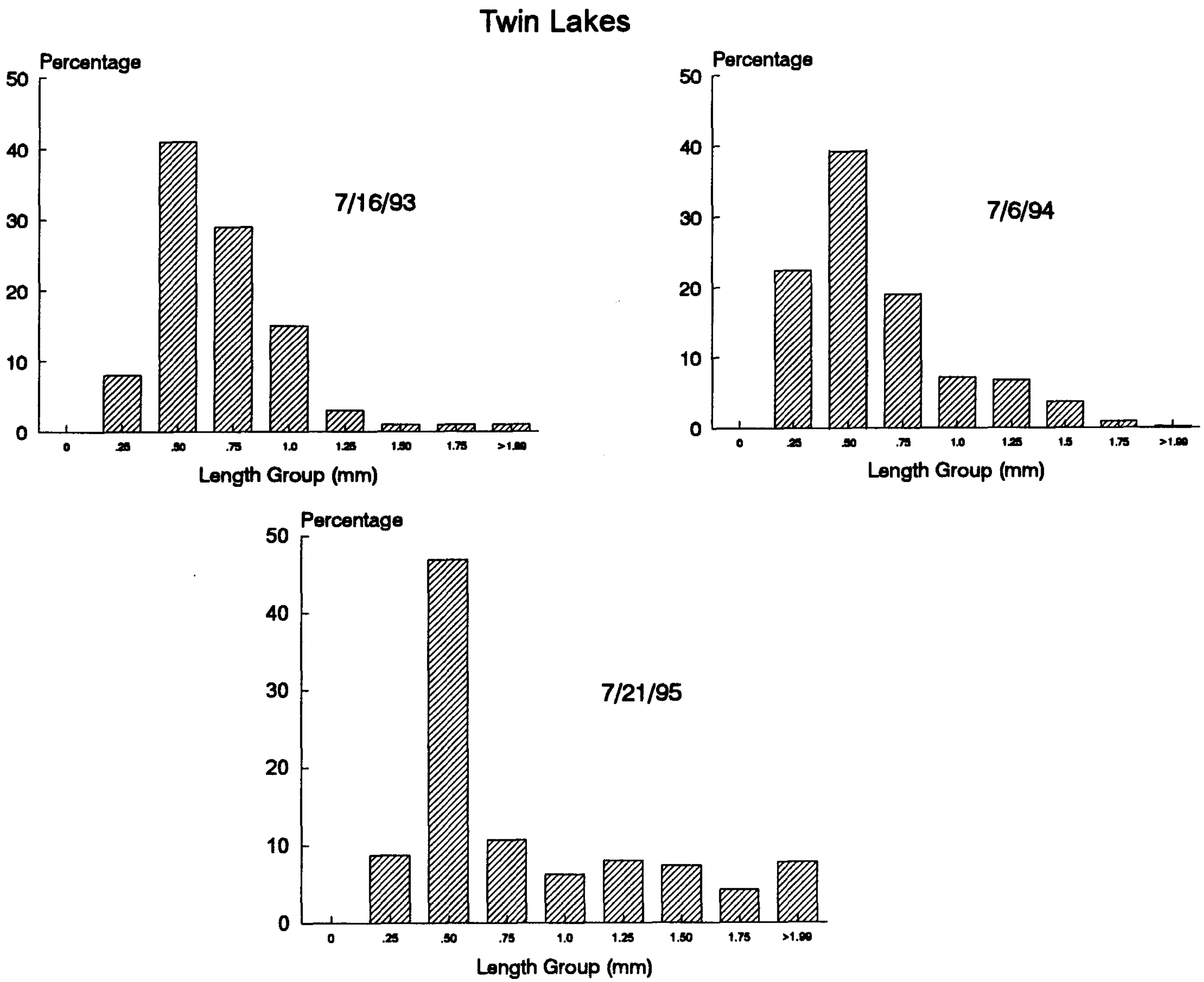
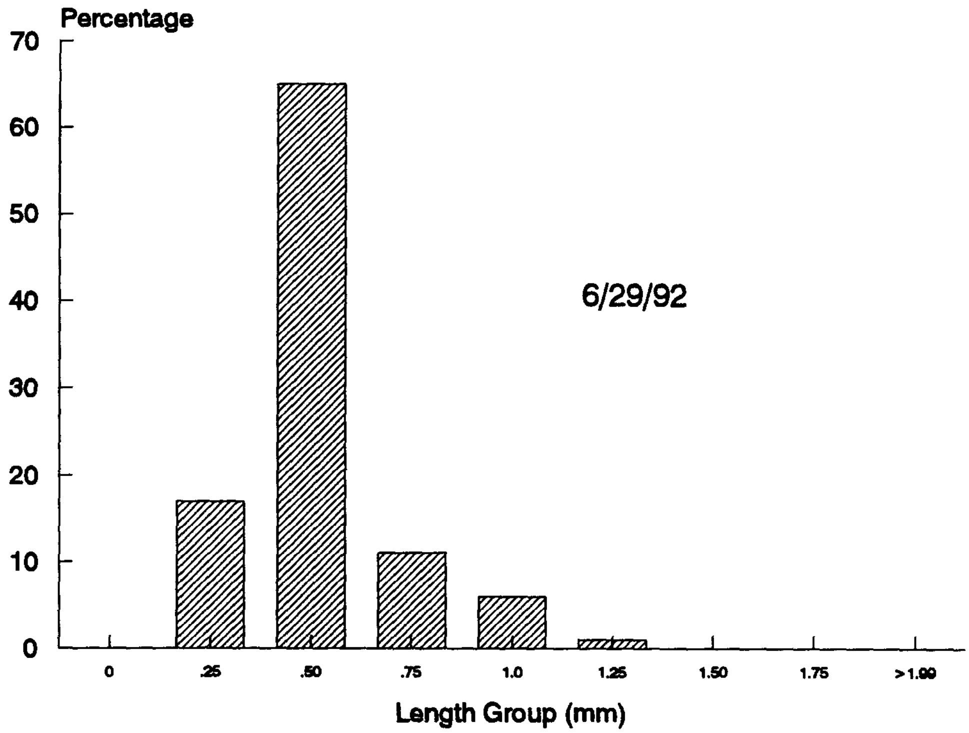
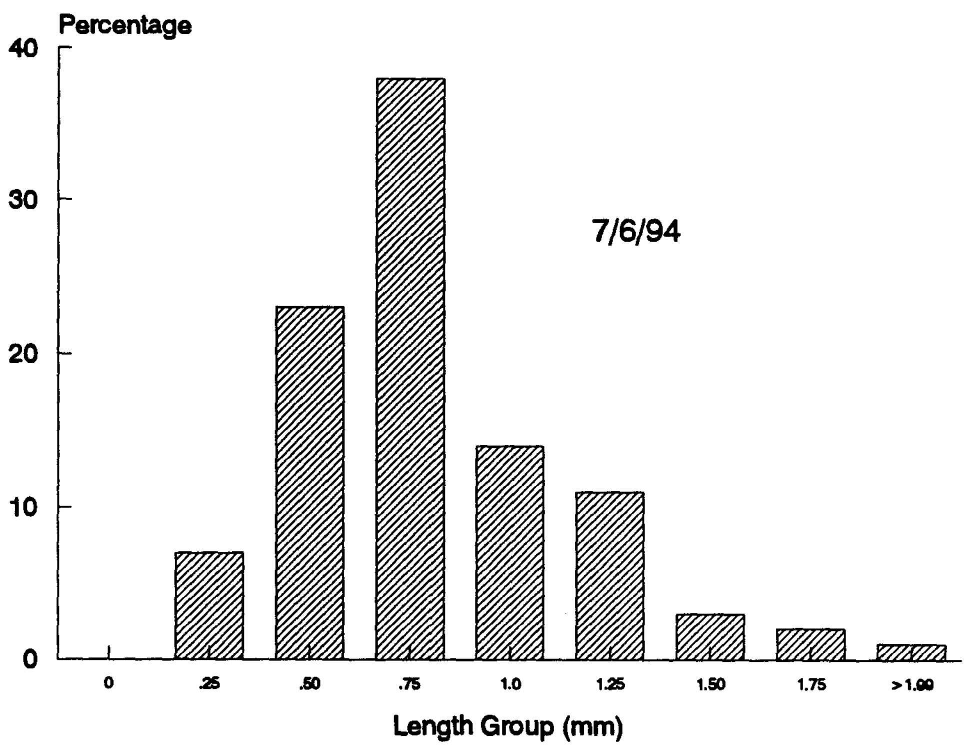


Appendix G. Continued.

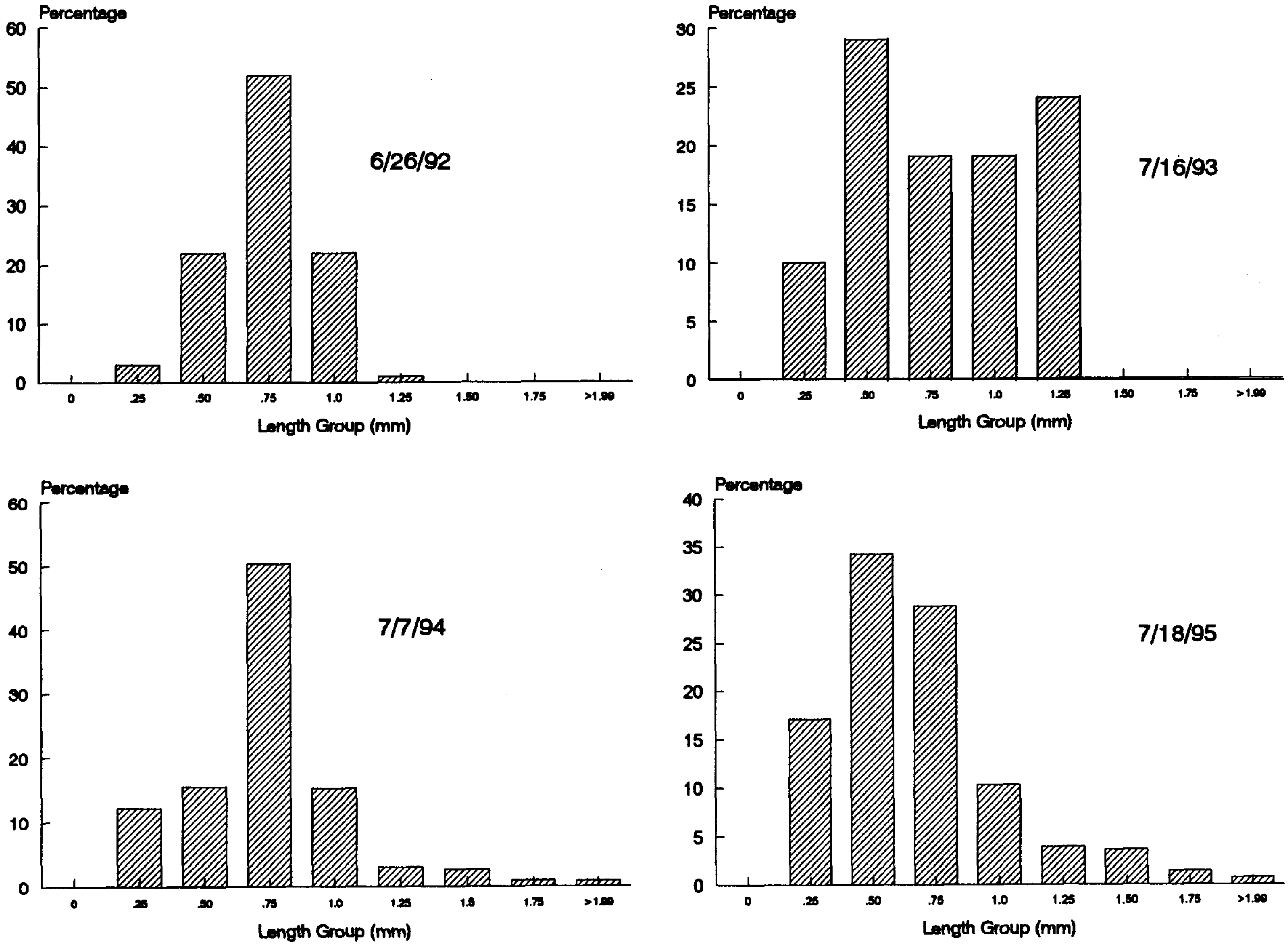
Winder Reservoir





Appendix G. Continued.

24-Mile Reservoir



Appendix G. Continued.

Appendix H. Data summary for zooplankton size structure in Idaho lakes and reservoirs with fingerling-catchable evaluations, 1992-1995.

		Taxonomic	Relative abundance by size (mm)								Percent of Cladocera
Location	Date	Group	0.25	0.50	0.75	1.00	1.25	1.50	1.75	≥ 2.00	≥ 1.50 mrrl
Spirit Lake	5/24/92	Bosmina	13	10							
		Copepods	47	293	42	6					0.0
		Daphnia		2	2						
	9/16/92	Bosmina	52	40							
		Copepods	6	28	19	3					0.0
		Daphnia									
	8/10/93	Bosmina	3	4							
		Copepods	201	978	163	28	4				
		Daphnia	9	60	75	77	14				0.0
Hauser Lake	5/24/92	Bosmina									
		Copepods	11	3							
		Daphnia		12	16	8	26	6	6	2	17.7
	9/16/92	Bosmina	2	1							
		Copepods	12	11	3						
		Daphnia		5	11	7	7	4	6	2	28.6
	8/15/93	Bosmina									
		Copepods	3	2	1						
		Daphnia		1	3	10	1				0.0
Spring Valley Reservoir	5/24/92	Bosmina									
		Copepods	29	8	12						
		Daphnia			8						0.0
	9/10/92	Bosmina	183	377	79						
		Copepods	39	10	2						
		Daphnia			4	4	3	7			0.0

Appendix H. Continued.

Location	Date	Taxonomic Group	Relative abundance by size (mml 0.25	0.50	0.75	1.00	1.25	1.50	1.75	≥ 2.00	Percent of Cladocera ≥ 1.50 mm
Mann Lake	5/25/92	Bosmina	1	6							
		Copepods	12	74	8	3	1				
		Daphnia		6	16	8	6	1			2.3
	9/9/92	Bosmina	388	7	2						
		Copepods	16	7	2						
		Daphnia	6	28							0.0
	8/18/93	Bosmina	2								
		Copepods	19	95	28	8					
		Daphnia		15	114	8	3	4			2.7
Winchester Lake	5/22/92	Bosmina	7	5							
		Copepods	256	110	5	3					
		Daphnia		3	7	2	4	2			1.1
	9/9/92	Bosmina		2							
		Copepods	4	2							
		Daphnia		100	57	71	24	2			0.8
	6/22/93	Bosmina									
		Copepods	10	42	2						
		Daphnia		21	177	45	28	26	25	6	17.4
Soldiers Meadow Reservoir	5/23/92	Bosmina	4		1						
		Copepods	22	77	51						
		Daphnia			3	1	1				0.0
	9/9/92	Bosmina	12	299	45						
		Copepods	22	56	59	15					
		Daphnia		6	48	45	3	2			2.0

Appendix H. Continued.

Location	Date	Taxonomic Grouo	Relative abundance by size (mml 0.25	0.50	0.75	1.00	1.25	1.50	1.75	≥ 2.00	Percent of Cladocera ≥ 1.50 mrrt
Soldiers Meadow (cont.)	6/22/93	Bosmina		3							
		Copepods		14	20	9	2				
		Daphnia	2	32	44	21	13	4			3.4
	8/13/93	Bosmina									
		Copepods	2	19	7	3					
		Daphnia	2	53	122	46	36	5			1.9
Cascade Reservoir	5/20/92	Bosmina	408	19							
		Copepods	6	9	11						
		Daphnia		3							0.0
	6/4/92	Bosmina	43	34							
		Copepods	1	3	12						
		Daphnia		9	4	3	5	3	3	2	27.6
	6/11/92	Bosmina	7	8							
		Copepods	6	9	19	6	1				
		Daphnia		8	12	2	2	1	2	4	22.6
	7/16/92	Bosmina	3	3							
		Copepods	1	7	19	7					
		Daphnia		1		2	3	1			14.3
	7/23/92	Bosmina	305	1							
		Copepods	7	25	17	9					
		Daphnia		10	8	5	8	4	2	2	20.5
	7/30/92	Bosmina									
		Copepods	45	33	30	3					
		Daphnia		8	23	47	28	10	1		9.4

Appendix H. Continued.

Location	Date	Taxonomic Group	Relative abundance by size Imml 0.25	0.50	0.75	1.00	1.25	1.50	1.75	≥2.00	Percent of Cladocera ≥ 1.50 mm
Cascade Reservoir (cont.)	8/13/92	Bosmina	1	3							
		Copepods	36	100	43	13					
		Daphnia		12	5	11	10	6	9	5	34.5
	8/20/92	Bosmina			1						
		Copepods	1	11	21	2		1			
		Daphnia		21	7	1	1	3			9.1
C.J. Strike Reservoir	7/6/92	Bosmina	99	14							
		Copepods	1	4	2						
		Daphnia		3	1	3					0.0
Magic Reservoir	5/7/92	Bosmina	76	138	43	12					
		Copepods	47	179	37	15	1				
		Daphnia			21	19	2	1			2.3
	7/3/92	Bosmina									
		Copepods	53	113	17						
		Daphnia		11	32	21	18	8	5	1	14.6
	7/2/93	Bosmina									
		Copepods	47	212	33	4					
		Daphnia		7	23	36	28	23	15	10	27.9
	6/23/94	Bosmina	4								
		Copepods	612	519	420	6					
		Daphnia		126	196	147	133	223	93	45	37.5
	7/12/94	Bosmina									
		Copepods	3	36	20	4					
		Daphnia		1	14	1 1	24	1 1			18.0

Appendix H. Continued.

Location	Date	Taxonomic Group	Relative abundance by size (mm) 0.25	0.50	0.75	1.00	1.25	1.50	1.75	≥2.00	Percent of **Cladocera** ≥1.50 mm
Magic Reservoir (cont.)	8/18/94	Bosmina									
		Copepods	98	312	133	17					
		Daphnia	4	33	107	159	78	32	6	11	11.4
		Chydorus	1,439								
	10/11/94	Bosmina	11	1							
		Copepods	1,720	1,430	475	1					
		Daphnia	1	15	4	2		1			4.3
	5/11/95	Copepoda	463	588	534	168	21				
		Cladocera	43	53	28	4		2			1.5
	7/12/95	Copepoda	283	208	104	22	10		1		
		Cladocera	14	41	99	113	79	102	84	77	43.2
	9/13/95	Copepoda	231	369	129	17					
		Cladocera	85	51	80	64	36	18	9	58	21.2
Little Wood Reservoir	517/92	Bosmina	1	8	1						
		Copepods	29	16	3	4					
		Daphnia		19	398	25	43	9	1		2.0
	7/4/92	Bosmina									
		Copepods	10	99	1						
		Daphnia			2	4	1	2		3	41.7
	7/2/93	Bosmina									
		Copepods	1	4	6	2	2	1			
		Daphnia		3	4	5	7	6			0.0
	7/28/93	Bosmina									
		Copepods	3	19	36	22	4	1	2		
		Daphnia		68	36	31	98	78	22	7	31.5

Appendix H. Continued.

		Taxonomic Group	Relative abundance by size (mm) 0.25	0.50	0.75	1.00	1.25	1.50	≥1.75	≥2.00	Percent of **Cladocera** ≥1.50 mm
Little Wood (cont.)	6/23/94	Bosmina									
		Copepods	223	447	761	331	131	17	2		
		Daphnia	3	15	22	111	661	540	139	23	46.4
	7/11/94	Bosmina									
		Copepods	183	1,965	1,796	469	180	64	33	21	
		Daphnia		15	72	253	223	380	197	63	53.2
	8/19/94	Bosmina	18	3							
		Copepods	7	159	119	62	11	2	1		
		Daphnia		78	143	69	46	33	35	9	18.6
		Ceriodaphnia	3	2	4	5					
		Diaphanosoma	3	20	27	32	15				
	10/12/94	Bosmina									
		Copepods	241	59	92	93	25				
		Daphnia		93	443	265	182	59	3		5.9
		Diaphanosoma			16	92	90	10			
	5/27/95	Copepoda	4	6	10	11	1	1			
		Cladocera	139	17	4	1	1	1			0.6
	7/11/95	Copepoda	53	84	77	3		2	1		
		Cladocera	10	11	29	33	14	9	2		10.2
	9/12/95	Copepoda	27	84	77	18	8	2			
		Cladocera	46	150	136	124	93	34	11	4	8.2
Springfield Lake Reservoir	6/25/92	Bosmina	12	22	30	1					
		Copepods									
		Daphnia				2	1				8.2
		Eurycerus			3	3	4	3	1	3	

Appendix H. Continued.

Location	Date	Taxonomic Group	Relative abundance by size 0.25	0.50	0.75	1.00	1.25	1.50	1.75	≥ 2.00	Percent of Cladocera ≥ 1.50
Springfield (cont.)	6/22/94	Bosmina	20	4							
		Copepods	1	4	1	1					
		Daphnia	6	30	19	29	35	25	2	1	14.0
		Eurycerus	1	1	4	4		3	2	1	
		Ceriodaphnia	18	25	21	5			1	1	
Daniels Reservoir	5/12/92	Bosmina		1	2						
		Copepods	248	160	173	88	3	1			
		Daphnia		28	325	66	24	38	17	5	11.9
	6/27/92	Bosmina	3	4							
		Copepods	25	83	13						
		Daphnia		6	37	5	5	2	1		5.3
	7/14/93	Bosmina									
		Copepods	242	321	149	120	1	1			
		Daphnia	2	57	138	148	85	73	7	4	16.3
	9/21/93	Bosmina		7	1						
		Copepods	23	64	42	3					
		Daphnia	2	23	18	27	8	9	3	2	15.2
	6/21/94	Bosmina									
		Copepods	371	412	207	103	4				
		Daphnia		16	123	318	260	68	5		9.2
		Chydorus	24								
	7/8/94	Bosmina									
		Copepods	236	816	302	1					
		Daphnia			122	93	91	186	92	16	49.0
		Chydorus	32								
		Ceriodaphnia	36	31	26						

Appendix H. Continued.

Location	Date	Taxonomic Group	Relative abundance by size (mm) 0.25	0.50	0.75	1.00	1.25	1.50	1.75	≥ 2.00	Percent of **Cladocera** ≥ 1.50 mm
Daniels Res. (cont.)	8/8/94	Bosmina									
		Copepods	131	526	322	41	3				
		Daphnia		16	74	31	34	33	12	13	27.2
		Chydorus	4	1							
		Ceriodaphnia	129	399	84						
	9/6/94	Bosmina	1								
		Copepods	1,430	754	557		1				
		Daphnia		49	438	176	62	85	63	23	19.1
	10/6/94	Bosmina									
		Copepods	1,458	738	700	40					
		Daphnia		21	35	31	37	8			6.1
		Chydorus	34								
		Ceriodaphnia	1,655	1,413	1,162	7					
	5/18/95	Copepoda	52	30	29	29	15	4			
		Cladocera	35	92	151	23	10	10	14	8	9.3
	7/17/95	Copepoda	186	289	122	26					
		Cladocera	28	25	14	20	22	22	10	8	26.8
	9/22/95	Copepoda	93	132	37	5					
		Cladocera	177	132	93	26	15	12	19	38	13.5
Twin Lakes	5/12/92	Bosmina									
		Copepods	6	8	3						
		Daphnia		3	8	3	3	2			10.5
	6/30/92	Bosmina	5	1							
		Copepods	159	72	2						
		Daphnia		47	87	10	18	1			0.6

Appendix H. Continued.

Location	Date	Taxonomic Group	Relative abundance by size (mm) 0.25	0.50	0.75	1.00	1.25	1.50	1.75	≥ 2.00	Percent of **Cladocera** ≥ 1.50 mm
Twin Lakes (cont.)	7/16/93	Bosmina		10							
		Copepods	51	247	133	71	11				
		Daphnia	2	26	66	29	13	7	10	5	13.9
	6/21/94	Bosmina	1								
		Copepods	1,570	1,044	468	72					
		Daphnia		33	599	294	165	177	64	12	18.9
	7/6/94	Bosmina	3								
		Copepods	438	738	219	20					
		Daphnia	2	29	143	129	155	86	21	4	19.5
		Ceriodaphnia	63	50	36						
	8/9/94	Bosmina	37								
		Copepods	881	295	138	6					
		Daphnia		6	145	71	34	31	16	5	16.9
	7/21/95	Copepoda	53	300	41	3					
		Cladocera	4	6	29	38	52	48	28	51	49.6
	9/20/95	Copepoda	379	379	143	29	2	1	1	2	
		Cladocera	27	52	53	71	43	29	10	48	26.1
Winder Reservoir	6/29/92	Bosmina	132	84							
		Copepods	50	564	2						
		Daphnia		52	115	65	7				0.0
	7/15/93	Bosmina		2							
		Copepods	62	118	188	8					
		Daphnia	28	166	289	168	141	43	22	6	8.2
Treasureton Reservoir	6/30/92	Bosmina	3								
		Copepods	36	24	8	11					
		Daphnia		4	24	26	13	8	1		11.8

Appendix H. Continued.

Location	_Date	Taxonomic Group	0.25	0.50	0.75	1.00	1.25	1.50	1.75	≥2.00	Percent of Cladocera ≥1.50 mm
			Relative abundance by size lmm)								
Treasureton Res. (cont.)	7/14/93	Bosmina									
		Copepods	44	150	27	19	15				
		Daphnia	4	10	36	56	24	14	5	6	16.1
	9/7/94	Bosmina	3								
		Copepods	3	34	20						
		Daphnia			62	94	83	50	34	65	38.4
	10/25/94	Bosmina									
		Copepods	3	358	203	2					
		Daphnia		2	75	177	158	124	85	51	38.7
	5/16/95	Copepoda	174	2,279	1,417	165	27	2			
		Cladocera	9	44	387	490	144	82	98	84	19.7
	7/20/95	Copepoda	86	95	39	28	1			3	
		Cladocera	11	43	74	65	29	15	11	11	14.3
	9/19/95	Copepoda	80	143	59	32					
		Cladocera	9	34	95	61	28	17	10	21	17.5
Chesterfield Reservoir	5/13/92	Bosmina	3	3							
		Copepods	12	11	1		1				
		Daphnia		2	20	59	44	3	7	5	10.7
	7/16/93	Bosmina									
		Copepods	37	156	107	43	8	1			
		Daphnia	39	141	68	20	29	14	10	16	11.9
	9/13/94	Bosmina	10	3							
		Copepods	17	59	124	9	21	1			
		Daphnia		2	216	437	667	499	162	133	37.5
		Chydorus	1,961	7							
		Ceriodaphnia	597	1,369	901						

Appendix H. Continued.

Location	Date	Taxonomic Group	Relative abundance by size (mm) 0.25	0.50	0.75	1.00	1.25	1.50	1.75	≥ 2.00	Percent of Cladocera ≥1.50 mm
Chesterfield Res. (cont.)	10/25/94	Bosmina	9	4							
		Copepods	105	81	468	59	11	1			
		Daphnia		2	143	226	593	351	124	96	37.2
		Chydorus	466								
		Ceriodaphnia	29	168	243						
	7/19/95	Copepoda	9	27	8	5					
		Cladocera	24	14	18	51	21	10	6	23	23.4
	9/19/95	Copepoda	17	55	33	22	2		4		
		Cladocera	346	90	26	4	3			8	1.7
24-Mile Reservoir	6/26/92	Bosmina									
		Copepods	9	54	144	71	2				
		Daphnia		17	23	1	2	1			2.3
	6/30/93	Bosmina									
		Copepods	16	51	19	25	10				
		Daphnia		2	21	14	11	5	10	1	25.0
	7/16/93	Bosmina									
		Copepods	2	6	3	4	3				
		Daphnia			1		2				0.0
	9/22/93	Bosmina									
		Copepods	2	2	1		1				
		Daphnia	1		17	5		1	2		11.5
	6/21/94	Bosmina									
		Copepods	255	661	765	263	18	18	5	1	
		Daphnia		35	295	203	52	44	44	19	15.5

Appendix H. Continued.

Location	Date	Taxonomic Grout)	Relative abundance by size (mm) 0.25	0.50	0.75	1.00	1.25	1.50	1.75	≥ 2.00	Percent **of Cladocera** ≥ 1.50 mrn
24-Mile Res. (cont.)	7/7/94	Bosmina	2								
		Copepods	85	91	318	79	4	5			
		Daphnia		23	82	31	15	12	12	12	13.7
	8/10/94	Bosmina	1								
		Copepods	57	55	78	9	18	3			
		Daphnia	5	23	49	11	7	7	10	6	19.5
	9/8/94	Bosmina									
		Copepods	10	26	38	21	11	8			
		Daphnia		2	55	35	25	25	34	13	38.1
	10/4/94	Bosmina									
		Copepods	6	6	4	3	3	5			
		Daphnia			11	4	7	10	7	6	51.1
	5/17/95	Copepoda	17	12	13	24	1				
		Cladocera	1	25	75	53	36	51	19	6	28.6
	7/18/95	Copepoda	39	81	66	22	2	1	1	1	
		Cladocera	9	15	15	7	9	9	3	1	19.1
	*9/21/95	Copepoda	3	4	1	1					
		Cladocera	27	14	12	5	3	4		2	9.0
Ririe Reservoir	5/5/92	Bosmina	56	48							
		Copepods	30	23	20	3					
		Daphnia		7	7	2	7				0.0
	6/10/93	Bosmina	129	95	2						
		Copepods	14	19	33	18	5	1			
		Daphnia	5	11	34	35	25	1			0.9

Appendix H. Continued.

Location	Date	Taxonomic Group	Relative abundance by size (mm) 0.25	0.50	0.75	1.00	1.25	1.50	1.75	≥ 2.00	Percent of Cladocera ≥1.50 mm
Ririe Res. (cont.)	7/23/93	Bosmina	2	3							
		Copepods	6	14	6	2	1	1			
		Daphnia		6	35	15	4	2			3.2
	9/24/93	Bosmina	4	14							
		Copepods	164	352	127	55	19	1			
		Daphnia	3	77	337	166	58	25	6		4.6

* Sample of one net pull at each of three sites instead of the standard three net pulls at each of three sites.

Appendix I. Temperature and oxygen profiles for nine Idaho waters with fingerling-catchable stocking evaluations, 1994-1995.

Date	Depth (m)	Dissolved Oxygen (mg/l)	Temperature (°C)	Date	Depth (m)	Dissolved Oxygen (mg/l)	Temperature (°C)
Magic Reservoir							
06/23/94	surface	9.8	15.0	07/12/94	surface	10.4	16.0
	1	10.0	15.0		1	10.2	16.0
	2	9.6	15.0		2	10.0	15.5
	3	10.0	14.0		3	9.4	15.3
	4	9.5	13.0		4	9.2	15.0
	5	9.4	12.0		5	8.2	12.5
	7	8.8	11.5		6	8.2	13.0
	9	8.9	11.0				
	11	6.4	11.0				
	12	3.5	12.0				
08/18/94	surface	7.8	18.1	10/1 1/94	surface	18.5	6.1
	1	8.0	17.9		1	12.9	6.1
	2	6.5	16.4		2	10.9	6.1
	3	5.9	16.2		3	9.4	6.0
	4	6.0	16.2		4	7.9	6.0
	5	5.9	16.2		5	7.3	6.0
	6	5.2	16.1				
	7	5.5	16.3				
05/11/95	surface	10.1	6.5	07/12/95	surface	8.1	19.1
	1	10.0	6.5		1	7.9	18.9
	2	10.1	5.7		2	8.0	18.4
	3	10.0	5.4		3	7.7	17.7
	4	10.0	5.4		4	7.7	17.6
	5	9.9	5.4		5	7.7	17.4
	6	9.9	5.3		6	7.7	16.1
	7	10.0	5.3		7	7.9	15.5
	8	10.1	5.3		8	8.0	15.4
	9	10.0	5.3		9	7.9	15.2
	10	9.8	5.2		10	7.9	15.2
	11	10.5	5.1		11	8.0	15.0
	12	10.2	5.1		12	8.4	14.8
	13	10.1	4.5		13	8.8	13.0
	14	9.4	4.0		14	8.6	12.8
	15	9.3	3.7		15	7.8	12.2
09/13/95	surface	7.6	19.7		8	6.8	18.4
	1	7.7	19.6		9	6.8	17.7
	2	7.5	18.6		11	6.2	17.9
	3	8.0	18.8		12	6.3	17.2
	4	7.6	18.4		13	5.8	17.5
	5	7.5	18.3		15	5.3	17.1
	6	7.4	18.3		17.5	4.4	16.3
	7	7.0	17.9		19.5	2.8	15.7

Appendix I. Continued.

Date	Depth (m)	Dissolved Oxygen (mg/l)	Temperature (°C)	Date	Depth (m)	Dissolved Oxygen (mg/l)	Temperature (°C)
Little Wood Reservoir							
06/23/94	surface	8.4	13.5	07/11/94	surface	9.2	14.9
	1	8.2	13.0		1	9.2	14.9
	2	8.4	13.0		2	9.2	14.9
	3	8.4	13.0		3	9.2	14.8
	4	8.4	12.5		4	9.1	14.8
	5	8.5	12.5		5	9.1	14.8
	7	8.2	12.0		7	8.8	14.3
	9	8.2	11.0		9	8.5	13.6
	11	7.7	10.3		11	8.3	13.5
	13	7.4	10.0		13	7.8	13.0
	15	7.2	10.0				
	17	6.9	9.0				
	19	7.0	8.5				
	21	6.5	9.0				
08/19/94	surface	10.0	15.7	10/12/94	surface	14.4	6.5
	1	9.6	15.4		1	14.2	6.4
	2	8.7	15.3		2	7.4	6.3
	3	8.3	15.1		3	5.9	5.9
	4	7.8	14.8		4	6.5	5.8
	5	7.3	10.0		5	7.1	5.6
	6	7.3	5.0				
05/27/95	surface	6.7	10.7	07/28/95	surface	9.3	19.0
	1	6.3	10.7		1	9.0	18.5
	2	5.8	10.9		2	8.9	17.7
	3	5.5	10.9		3	8.7	17.2
	4	5.2	10.8		4	8.3	16.8
	5	4.9	10.7		5	8.1	16.4
	6	4.8	10.7		6	7.9	15.8
	7	4.7	10.4		7	7.7	13.9
	8	4.0	10.3		8	7.7	13.2
	9	3.3	10.5		9	7.9	11.9
	10	4.0	10.5		10	7.7	12.1
	11	3.9	10.5		11	7.7	12.0
	12	3.7	10.4		12	7.6	11.9
	13	3.5	10.8		13	7.6	11.6
	14	3.3	10.4		14	7.6	11.5
	15	3.2	10.7		15	7.6	11.3
09/12/95	surface	9.3	17.3		8	7.1	16.0
	1	9.0	17.1		9	6.8	15.9
	2	8.5	16.9		10	6.6	15.7
	3	8.3	16.7		11	6.1	15.6
	4	8.1	16.5		13	5.5	15.1
	5	8.2	16.6		15	5.3	15.0
	6	8.0	16.6		17	5.2	14.9
	7	7.4	16.0		19	5.1	14.7

Appendix I. Continued.

Date	Depth (m)	Dissolved Oxygen (mg/l)	Temperature (°C)	Date	Depth (m)	Dissolved Oxygen (mg/l)	Temperature (°C)
Springfield Reservoir							
06/22/94	surface	15.4	17.0				
	1	15.2	14.0				
	2	14.8	12.5				
	3	13.0	12.0				
	4	11.2	13.0				
Daniels Reservoir							
06/21/94	surface	16.8	14.0	07/08/94	surface	9.0	17.0
	1	16.0	14.0		1	8.8	15.3
	2	16.2	14.0		2	9.0	14.5
	3	15.4	13.0		3	8.6	14.0
	4	13.2	12.0		4	8.2	14.0
	5	12.4	12.0		5	5.8	12.0
	7	6.2	10.0		7	2.0	10.0
	9	0.9	7.0		9	1.8	7.0
	11	1.0	**5.5**				
	12	1.0	5.0				
08/08/94	surface	9.6	17.0	09/06/94	surface	9.6	13.5
	1	9.6	17.0		1	10.3	13.0
	2	9.3	16.0		2	9.8	13.0
	3	8.2	16.0		3	10.2	13.0
	4	4.8	15.0		4	10.0	13.0
	5	1.4	13.0		5	10.2	13.0
	7	0.4	8.0		7	9.4	13.0
	9	0.6	7.0		8	5.4	12.0
10/06/94	surface	15.2	7.6				
	1	7.6	7.6				
	2	8.4	7.7				
	3	7.8	7.7				
	4	8.1	7.8				
	5	7.3	7.7				
	6	6.9	7.7				
	7	6.4	7.5				
	8	6.4	7.2				
	9	6.1	6.9				

Appendix I. Continued.

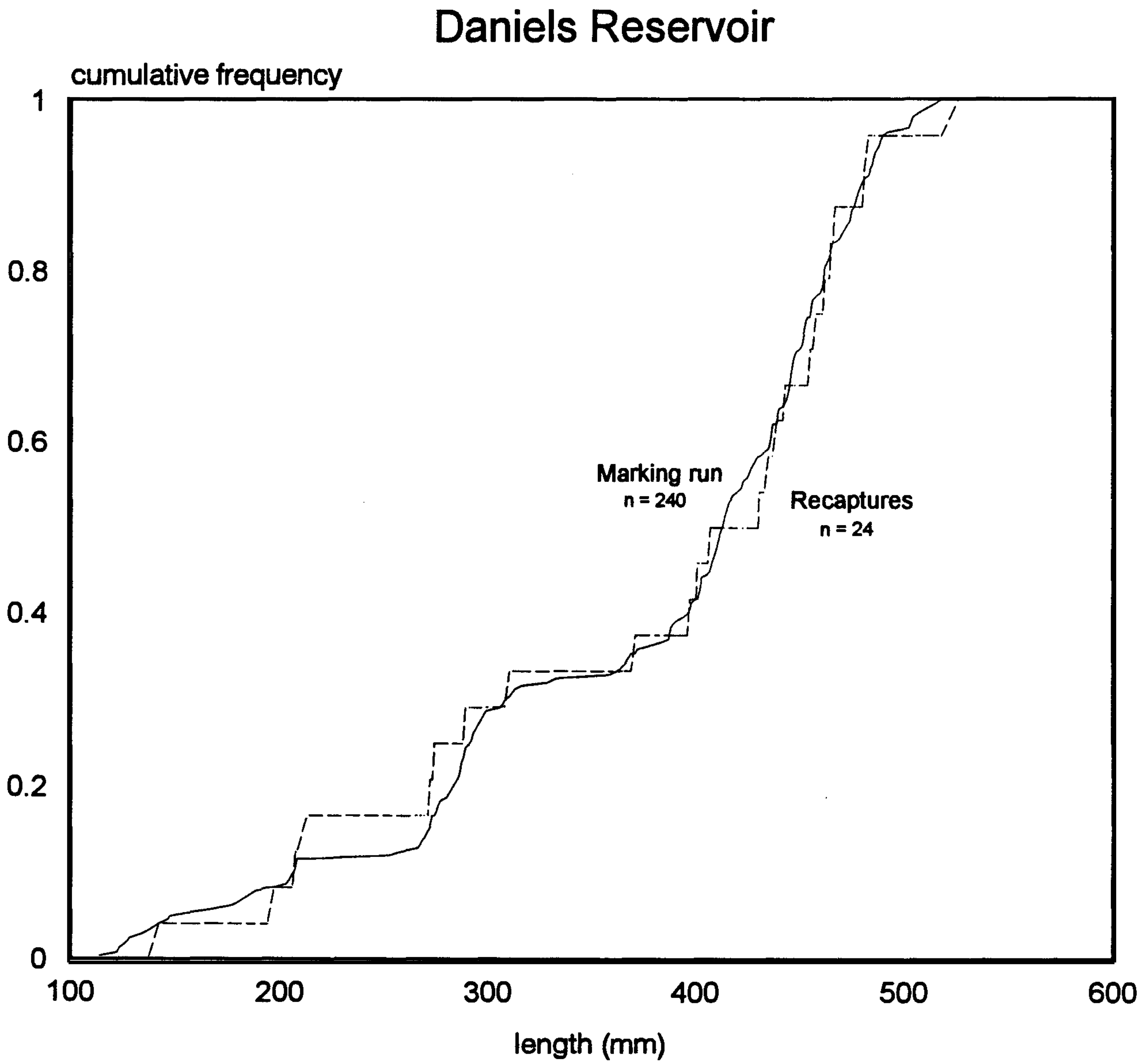
Date	Death (m)	Dissolved Oxygen (mg/l)	Temperature (°C)	Date	Death (m)	Dissolved Oxygen (mg/l)	Temperature (°C)
Twin Lakes							
06/21/94	surface	15.2	15.3	07/06/94	surface	7.3	20.2
	1	15.0	15.3		1	7.1	20.0
	2	14.8	15.3		2	7.3	20.0
	3	15.0	15.0		3	7.2	19.7
	4	15.0	15.0		4	7.2	19.5
	5	15.0	14.5		5	7.0	19.2
	7	13.0	12.5		7	1.8	15.0
	9	1.0	10.0		9	0.5	13.0
	11	1.2	7.0		10	0.5	12.0
	13	2.0	7.0				
08/09/94	surface	6.9	18.0				
	1	6.8	18.0				
	2	6.6	18.0				
	3	7.0	18.0				
	4	6.3	18.0				
	5	3.5	17.0				
Chesterfield Reservoir							
05/26/94	surface	9.0	18.2	06/23/94	surface	8.2	19.8
	1	9.0	18.0		1	8.1	20.0
	2	9.0	17.9		2	8.1	20.0
	3	9.0	17.7		3	8.1	20.0
	4	8.4	15.2		4	8.1	20.0
	5	7.9	14.5		5	7.8	19.8
	6	7.6	14.5		6	6.5	19.2
	7	7.2	14.3		7	6.1	19.0
	8	6.9	14.0		8	5.4	18.8
	9	6.3	13.8		9	2.4	18.0
	10	5.3	13.5		9.6	0.8	17.2
	11	4.6	13.5				
07/26/94	surface	8.7	22.0	08/17/94	surface	8.1	22.0
	1	8.7	22.0		1	8.0	21.8
	2	8.7	22.0		2	8.0	21.8
	3	8.6	22.0		3	8.0	21.8
	4	8.4	22.0		4	7.9	21.8
	5	8.2	21.8		5	7.6	21.8
	6	5.9	21.2		6	5.0	21.5
	7	3.5	20.7				
	7.6	2.4	20.7				

Appendix I. Continued.

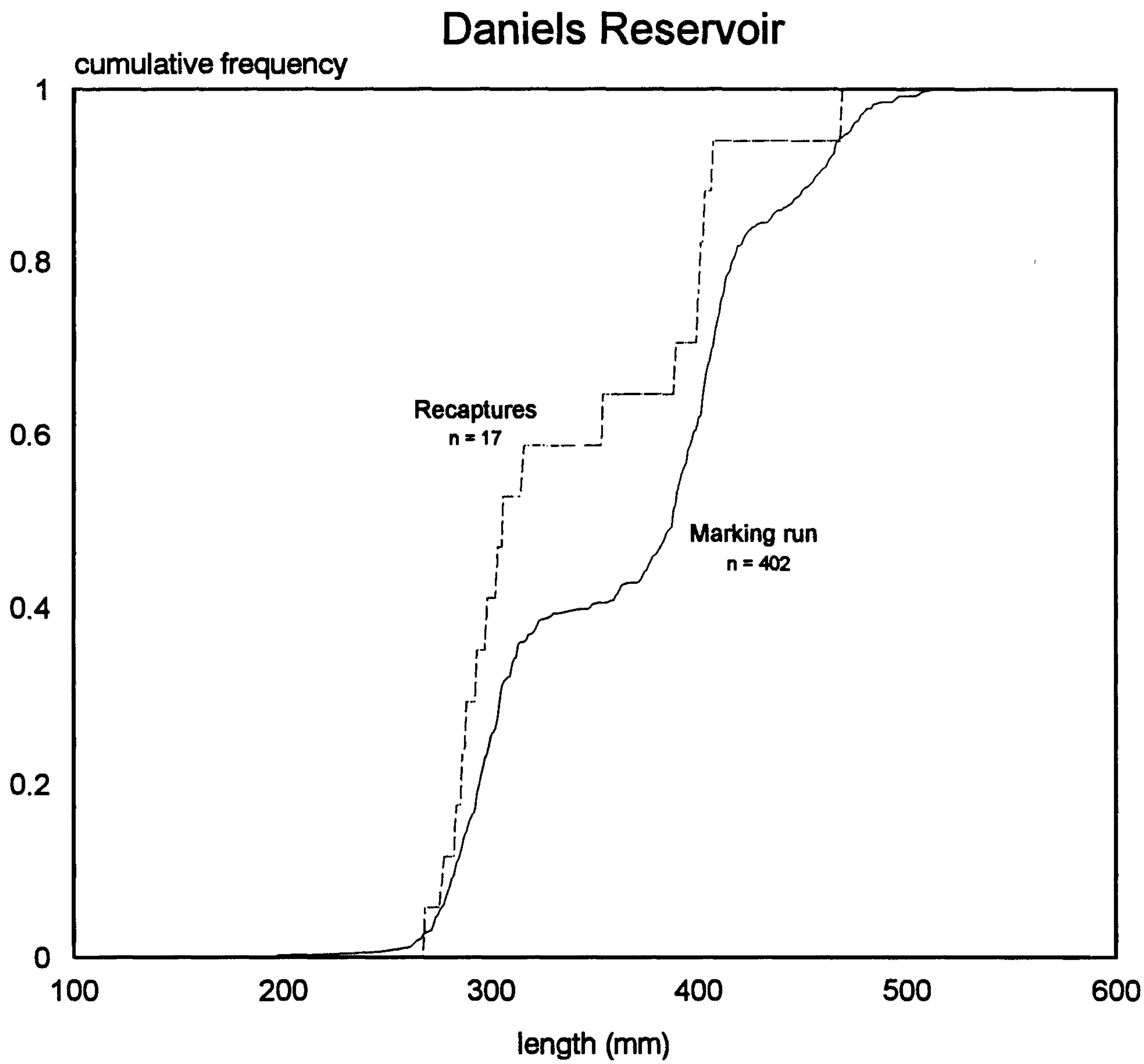
Date	Depth (m)	Dissolved Oxygen (mg/l)	Temperature (°C)	Date	Depth (m)	Dissolved Oxygen (mg/l)	Temperature (°C)
Chesterfield Reservoir (Cont.)							
09/12/94	surface	12.6	12.2	10/25/94	surface	16.2	3.5
	1	10.6	12.2		1	12.4	3.0
	2	8.7	12.0		2	5.2	3.0
	3	7.0	12.0		3	3.6	3.0
	4	6.2	12.0		4	4.5	3.0
	5	5.3	11.9		**5**	3.6	3.0
	6	4.7	11.7		6	3.0	3.0
	7	2.9	2.8				
24-Mile Reservoir							
06/22/94	surface	12.0	16.0	07/07/94	surface	10.4	16.0
	1	12.6	15.3		1	10.1	16.0
	2	12.8	15.0		2	9.5	15.5
	3	13.4	15.0		3	9.0	15.0
	4	13.6	15.0		4	9.0	15.0
	5	13.4	15.0				
	6	13.0	15.0				
	7	4.8	14.0				
08/10/94	surface	9.9	17.3	09/08/94	surface	10.2	13.0
	1	8.6	17.1		1	11.8	12.8
	2	6.2	16.8		2	8.1	12.0
	3	4.3	16.5		3	6.5	11.9
	4	3.4	16.5		4	8.0	11.8
10/04/94	surface	17.4	6.5				
	1	12.6	6.7				
	2	7.6	6.5				
	3	5.6	6.7				
	4	4.8	6.4				
Treasureton Reservoir							
05/26/94	surface	8.2	17.2	06/23/94	surface	8.7	19.2
	1	8.2	17.2		1	8.5	19.6
	2	8.2	17.2		2	8.5	19.6
	3	8.1	16.8		3	8.6	19.6
	4	7.3	15.3		4	8.6	19.6
	5	5.1	14.5		5	8.6	19.6
	6	3.7	14.2		5.6	7.6	19.0
	6.6	3.0	14.0				

Appendix I. Continued.

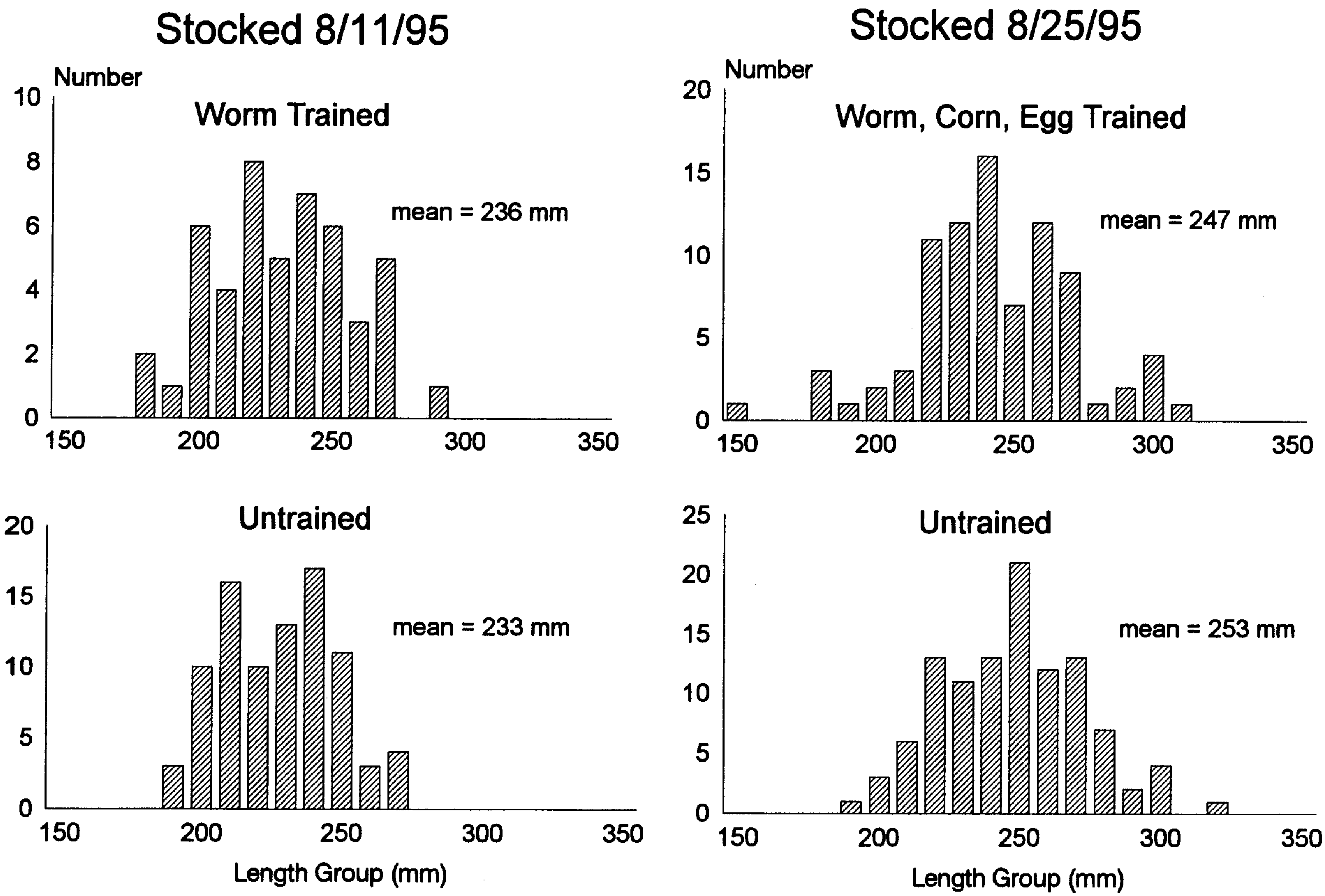
Date	Depth (m)	Dissolved Oxygen (mg/l)	Temperature (°C)	Date	Depth (m)	Dissolved Oxygen (mg/l)	Temperature (°C)
Treasureton Reservoir (Cont.)							
07/28/94	surface	8.7	20.2	08/17/94	surface	7.6	20.3
	1	8.7	20.2		1	7.5	20.3
	2	8.6	20.2		2	7.5	20.3
	3	8.7	20.2		3	7.5	20.3
	4	8.4	20.2		4	7.2	20.3
	4.3	7.8	20.2		4.3	5.8	20.0
09/07/94	surface	15.2	13.2	10/25/94	surface	14.8	3.5
	1	14.2	13.0		1	11.6	3.0
	2	9.4	12.1		2	6.6	3.0
	3	8.0	12.0		3	4.6	3.0
	4	8.5	12.0		4	4.3	3.0
Winder Reservoir							
05/26/94	surface	7.9	18.0	06/23/94	surface	9.1	20.5
	1	8.2	18.0		1	9.1	20.5
	2	9.2	17.0		2	9.1	20.5
	3	9.4	16.0		3	9.1	20.5
	4	9.2	16.0		4	9.1	20.5
	5	8.1	15.3		5	8.2	19.5
	6	6.8	14.8		6	6.9	19.0
	7	3.2	13.2		7	6.3	18.5
	8	1.7	11.1		8	1.8	18.2
	9	0.8	10.2				
07/28/94	surface	7.2	22.5	08/17/94	surface	6.8	21.0
	1	7.2	22.5		1	6.8	21.0
	2	7.1	22.5		2	6.4	21.0
	3	6.9	22.5		3	4.5	21.0
	4	6.4	22.5		4	1.5	20.5
	5	3.3	22.5				
	6	0.7	22.0				



Appendix J. Cumulative length frequency comparison of fish captured with an electrofishing boat during the mark-recapture experiment in June 1995.



Appendix K. Cumulative length frequency comparison of fish captured with a purse seine during the mark-recapture experiment in June 1995.



Appendix L. Length frequencies of food-trained and untrained fish stocked into Rock Creek and Little Smoky Creek, August 1995.

Prepared by:

Jeff C. Dillon
Senior Fishery Research Biologist

Charles B. Alexander
Senior Fishery Technician

Approved by:

IDAHO DEPARTMENT OF FISH AND GAME

Steven M. Huffaker, Chief
Bureau of Fisheries

Allan R. Van Vooren
Fisheries Research Manager

<u>Funds Expended</u>:

Contract period of April 1, 1995 to June 30, 1996

State:	$34,375
Federal:	$103,125
Total:	$137,500